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SUPPLEMENTAL DATA TO PHOTOFACT FOLDER 8 IN SET 272

Motorola models Y21K20, B, Y21T18, B, 21K20, B and 21T18, B were covered in Photofact Folder 8 — Set 272.

With the publication of this bulletin many new models and late production changes are added. Following is a list of all models and the chassis used in each.

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MODEL	CHASSIS	MODEL	CHASSIS
Y21C3A	QTS-525Y	21C3A	QTS-525
Y21C3BA	QTS-525Y	21C3BA	QTS-525
Y21K20, B	WTS-525Y	21K20, B	WTS-525
Y21K21A	QTS-525Y	21K21A	QTS-525
Y21K21ABD	QTS-525Y	21K21ABD	QTS-525
Y21K21AD	QTS-525Y	21K21AD	QTS-525
Y21K21BA	QTS-525Y	21K21BA	QTS-525
Y21K22A	QTS-525Y	21K22A	QTS-525
Y21K23A	QTS-525Y	21K23	QTS-525
Y21K23BA	QTS-525Y	21K23BA	QTS-525
Y21K24A	QTS-525Y	21K24A	QTS-525
Y21K27	RTS-525Y	21K27	RTS-525
Y21K27B	RTS-525Y	21K27B	RTS-525
Y21K28	WTS-525Y	21K28	WTS-525
Y21K28B	WTS-525Y	21K28B	WTS-525
Y21K31	TTS-525Y	21K31	TTS-525
Y21K31B	TTS-525Y	21K31B	TTS-525
Y21K32	QTS-525Y	21K32	QTS-525
Y21K32A	WTS-525Y	21K32A	WTS-525
Y21K32B	QTS-525Y	21K32B	QTS-525
Y21K32BA	WTS-525Y	21K32BA	WTS-525
Y21K34	QTS-525Y	21K34	QTS-525
Y21K34B	QTS-525Y	21K34B	QTS-525
Y21T18, B	RTS-525Y	21T18, B	RTS-525
Y21T19A	QTS-525Y	21T19A	QTS-525
Y21T19BA	QTS-525Y	21T19BA	QTS-525
Y21T23	TTS-525Y	21T23	TTS-525
Y21T23B	TTS-525Y	21T23B	TTS-525
Y21T24	QTS-525Y	21T24	QTS-525
Y21T24B	QTS-525Y	21T24B	QTS-525
			TS-525 Series

MOTOROLA CHASSIS QTS-525, Y, RTS-525, Y, TTS-525, Y, TS-525 Series, WTS-525, Y

PRODUCTION CHANGES
BULLETIN 147

PRODUCTION CHANGES
BULLETIN 147

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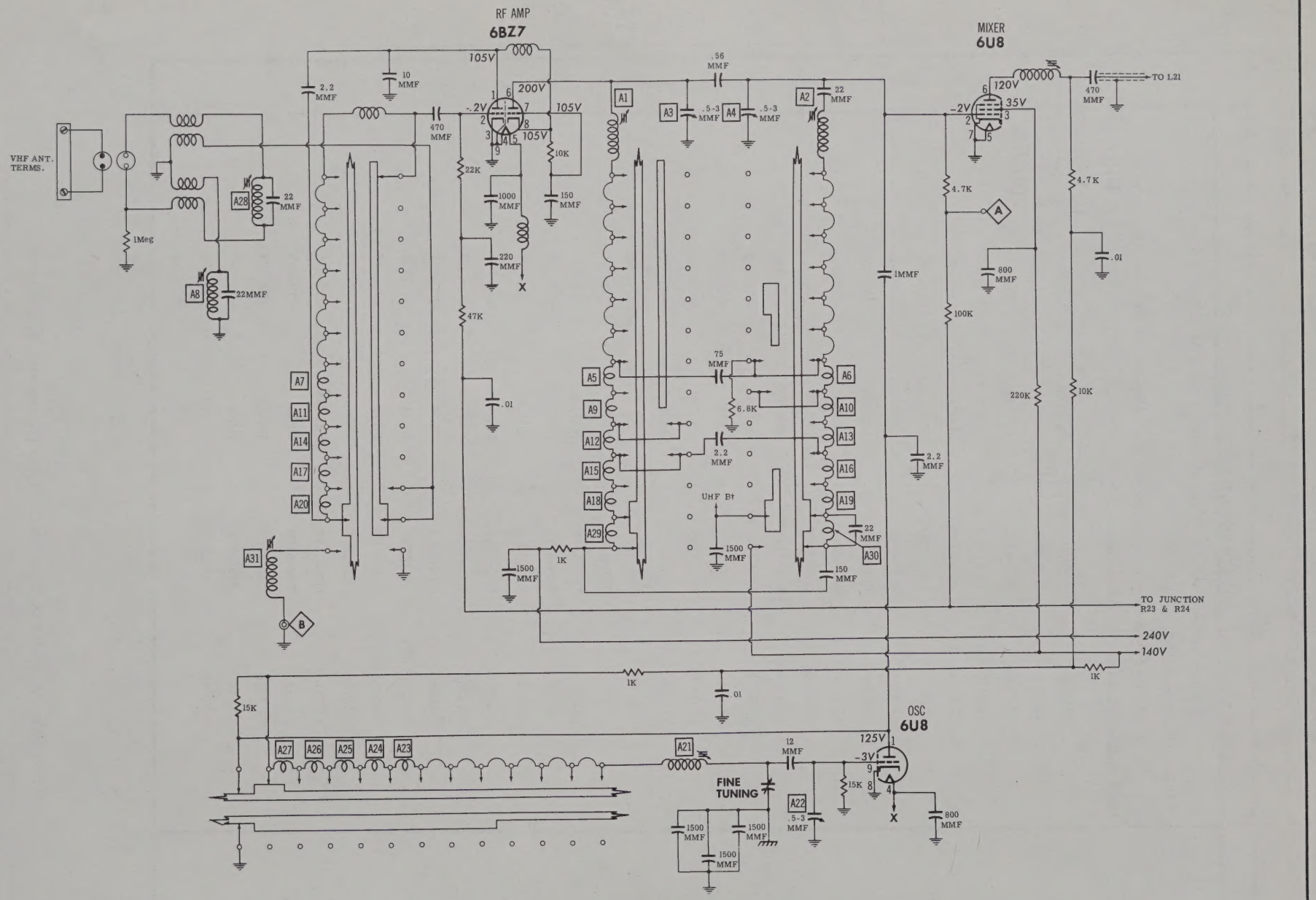
RF AMP
6BZ7
MIXER
6U8
OSC
6U8
VHF ANT. TERMS.
1Meg
A28
22 MMF
A8
22MMF
2.2 MMF
10 MMF
470 MMF
22K
1000 MMF
220 MMF
150 MMF
10K
47K
.01
105V
200V
-.2V
105V
105V
A1
.56 MMF
A3
.5-3 MMF
A4
.5-3 MMF
A2
22 MMF
1MMF
75 MMF
6.8K
2.2 MMF
UHF Bf
1500 MMF
1K
150 MMF
22 MMF
A30
A5
A9
A12
A15
A18
A29
A6
A10
A13
A16
A19
A7
A11
A14
A17
A20
A31
B
X
120V
35V
-2V
4.7K
A
800 MMF
100K
220K
4.7K
10K
.01
2.2 MMF
470 MMF
TO L21
TO JUNCTION R23 & R24
240V
140V
1K
1K
.01
15K
A27
A26
A25
A24
A23
A21
FINE TUNING
12 MMF
125V
-3V
15K
A22
.5-3 MMF
1500 MMF
1500 MMF
1500 MMF
800 MMF
X

	The 1KΩ resistor added in change "04" is removed from the junction of C72 and R41 and connected in series with a 39KΩ resistor to the 240V line. A .1MFD capacitor is connected from the junction of C72 and R41 to the junction of the 1KΩ and 39KΩ resistors.
Chassis QTS-525A-10 RTS-525A-10 TTS-525A-10 WTS-525A-10 QTS-525B-01 RTS-525B-01 TTS-525B-01 WTS-525B-01	TO INCREASE HORIZONTAL STABILITY An 82KΩ resistor is added in series with the horizontal hold control (R4). The horizontal hold control (R4) is decreased from 250KΩ to 100KΩ. The new control part number becomes #18K734145.
Chassis QTS-525A-11 RTS-525A-11 TTS-525A-11 WTS-525A-11 QTS-525B-02 RTS-525B-02 TTS-525B-02 WTS-525B-02	TO INCREASE HORIZONTAL SIZE T3, horizontal output transformer changed to part #24K735859.

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Remove battery used in IF alignment and ground AGC circuit by placing a jumper between AGC lug on tuner and chassis.
Allow 15 minute warm-up period for receiver and test equipment.
If sweep generator has no built-in marker, loosely couple a separate marker generator to the antenna terminals.
Adjustments A5, A6, A7 and A9 thru A29 are adjusted by compressing or expanding coil turns.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

RF AND MIXER ALIGNMENT

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. thru 47KΩ to point (A). Low side to chassis.	A1, A2	Pre-set adjustments A3 and A4 at mid-capacity. Pre-set A28 for maximum inductance (core fully clockwise). Pre-set A8 for MINIMUM inductance (core fully counter clockwise). Adjust A1 and A2 for maximum amplitude and response similar to Fig. 1.
2.	"	"	177MC (10MC Swp)	175.25MC 179.75MC	7	"	A3, A4	Adjust for maximum amplitude, proper tilt and correct marker positions as in Fig. 2.
3.	"	"	207MC (10MC Swp)	205.25MC 209.75MC	12	"		Check for proper response curve on each channel. If response is not within limits on each channel, repeat steps 1 and 2. If necessary, make compromise adjustments of A1 thru A4.
			201MC (10MC Swp)	199.25MC 203.75MC	11			
			195MC (10MC Swp)	193.25MC 197.75MC	10			
			189MC (10MC Swp)	187.25MC 191.75MC	9			
			183MC (10MC Swp)	181.25MC 185.75MC	8			
4.	"	"	85MC (10MC Swp)	83.25MC 87.75MC	6	"	A5, A6	Adjust A5, A6 and A7 in this order for response curve similar to Fig. 2. Adjust A5 and A6 for correct marker positions. Adjust A7 for maximum gain and MINIMUM tilt.
5.	"	"	"	87.75MC	"	"	A8	Adjust A8 until response curve is just affected at sound marker point.
6.	Two 120Ω Carbon Resistors	"	79MC (10MC Swp)	77.25MC 81.75MC	5	Vert. Amp. thru 47KΩ to point (A). Low side to chassis.	A9, A10, A11	Adjust for response curve similar to Fig. 2. Adjust A9 and A10 for correct marker positions and A11 for maximum gain and MINIMUM tilt.
7.	"	"	69MC (10MC Swp)	67.25MC 71.75MC	4	"	A12, A13, A14	Adjust for response curve similar to Fig. 2. Adjust A12 and A13 for correct marker positions and A14 for maximum gain and MINIMUM tilt.
8.	"	"	63MC (10MC Swp)	61.25MC 65.75MC	3	"	A15, A16, A17	Adjust for response curve similar to Fig. 2. Adjust A15 and A16 for correct marker positions and A11 for maximum gain and MINIMUM tilt.
9.	"	"	57MC (10MC Swp)	55.25MC 59.75MC	2	"	A18, A19, A20	Adjust for response curve similar to Fig. 2. Adjust A18 and A19 for correct marker positions and A20 for maximum gain and MINIMUM tilt.

	CHASSIS IDENTIFICATION Chassis TTS-525 is electrically identical to chassis RTS-525, except a 21AUP4 picture tube is used. Chassis QTS-525 is electrically identical to chassis RTS-525, except a 21AUP4A picture tube is used and is mounted with a 5 degree tilt.
Chassis QTS-525A-04 RTS-525A-04 TTS-525A-04 WTS-525A-04	The following production changes were made during production. TO ELIMINATE EXCESSIVE IGNITION NOISE PICK-UP R17 is decreased from 330KΩ to 10KΩ. R18 is decreased from 330KΩ to 220KΩ. TO IMPROVE SYNC STABILITY C73 is omitted. L25 is replaced by a 1.2KΩ resistor. R47 is disconnected from ground and connected to the junction of R35 and C44. R35 is decreased from 33KΩ to 22KΩ. The B+ lead feeding the screen of the 3rd. video IF (pin 6 of V5) is removed. A 1KΩ resistor is added from pin 6 of V5 to the junction of C72 and R41. A 22MMF capacitor is added from the junction of the 1KΩ resistor and R41 to ground. A coil and a 22MMF capacitor (connected in series) are connected from pin 6 of V5 to ground. R41 is decreased from 10KΩ to 5.6KΩ. R42 is decreased from 22KΩ to 10KΩ. A 3.3KΩ resistor is added between the junction of R41 and R42 and the junction of R40 and L33. R84 is omitted.
Chassis QTS-525A-05 RTS-525A-05 TTS-525A-05 WTS-525A-05	TO PREVENT LOSS OF SOUND AND PICTURE AT LOW CONTRAST LEVEL R44 is decreased from 1Meg to 680KΩ . TO IMPROVE BRIGHTNESS R42 is increased from 10KΩ to 12KΩ.
Chassis QTS-525A-06 RTS-525A-06 TTS-525A-06 WTS-525A-06	TO ALLOW V3 AND V4 TO WORK INDEPENDENTLY R34 is increased from 3KΩ to 6.8KΩ. A 6.8KΩ resistor is added from pin 6 of V3 to the 240V line. TO IMPROVE SOUND TO NOISE RATIO ON LOW CHANNELS L4 is changed to part #24K735125. C7 is increased from 22MMF to 47MMF. Tuner coding changes to part #TT-70B.
Chassis QTS-525A-07 RTS-525A-07 TTS-525A-07 WTS-525A-07	COMPONENT CHANGE R88 is omitted and the filament ground lead of V16 (horizontal output) is shortened.
Chassis QTS-525A-08 RTS-525A-08 TTS-525A-08 WTS-525A-08	TO ELIMINATE DOUBLE TUNING ON CHANNEL 2 L5 is changed to part #24A735121. L6 is omitted. L8 is replaced by three separate coils. Tuner coding changes to part #TT-70C or TT-70CY.
Chassis QTS-525A-08-0 RTS-525A-08-0 TTS-525A-08-0 WTS-525A-08-0	NEW VHF TUNER These chassis are identical to the "08", except a new tuner (part #TT-71) is used. A schematic and alignment procedure are given in this bulletin.
Chassis QTS-525A-09 RTS-525A-09 TTS-525A-09 WTS-525A-09	TO ELIMINATE VIDEO IF BLOCKING C59 and R53 are omitted. R52 is increased from 2.2KΩ to 10KΩ. R37 is increased from 1KΩ to 8.2KΩ . R41 which was decreased from 10KΩ to 5.6KΩ in change "04" is increased to 10KΩ.

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OSCILLATOR ALIGNMENT

Use only enough sweep generator output to produce usable pattern on scope.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
10.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	207MC (10MC Swp)	209.75MC	12	Vert. Amp. thru 47KΩ to 2nd. detector output (pin 3 of test socket). Low side to chassis.	A21	Preset A22 at mid-capacity. Adjust A21 to place marker in sound trap notch as in Fig. 3.
11.	"	"	213MC (10MC Swp)	215.75MC	13	"	A22	Check channels 7 thru 13 noting if sound marker for each channel falls just above the trap notch. If more than a 30 degree rotation of the fine tuning is required to place the marker in proper location on any high-band channel, set sweep generator and marker generator for channel 7 frequencies and adjust A22 to place sound marker in trap notch as in Fig. 3.
			207MC (10MC Swp)	209.75MC	12			
			201MC (10MC Swp)	203.75MC	11			
			195MC (10MC Swp)	197.75MC	10			
			189MC (10MC Swp)	191.75MC	9			
			183MC (10MC Swp)	185.75MC	8			
			177MC (10MC Swp)	179.75MC	7			
12.	"	"	213MC (10MC Swp)	215.75MC	13	"	A21	Check for correct sound marker position as in Fig. 3. If necessary, readjust A21 to place sound marker in trap notch.
13.	"	"	85MC (10MC Swp)	87.75MC	6	"	A23	Adjust to place sound marker in sound trap notch as in Fig. 3. A23 thru A27 are adjusted by compressing or expanding coil turns.
			79MC (10MC Swp)	81.75MC	5		A24	
			69MC (10MC Swp)	71.75MC	4		A25	
			63MC (10MC Swp)	65.75MC	3		A26	
			57MC (10MC Swp)	59.75MC	2		A27	

45.0MC TRAP ALIGNMENT

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
14.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	45.0MC (10MC Swp)	45.0MC	2	Vert. Amp. to pin 3 of test receptacle. Low side to chassis.	A28	Increase sweep generator output to produce visible marker on scope. Adjust A28 for MINIMUM response at 45.0MC.

UHF IF ALIGNMENT

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
15.	Direct	High side to point (B). Low side to chassis.	44MC (10MC Swp)	41.25MC 45.75MC	UHF	Vert. Amp. thru 47KΩ to point (A). Low side to chassis.	A29, A30, A31	Adjust A29, A30 and A31 for response similar to Fig. 4. Adjust A29 and A30 for correct marker positions and A31 for maximum gain and MINIMUM tilt. A29, and A30 are adjusted by compressing and expanding coil turns.

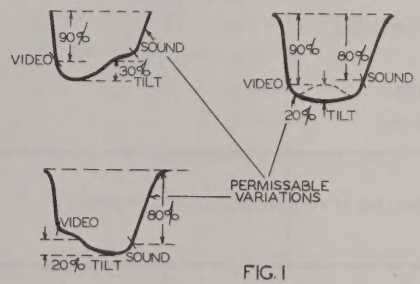

FIG. 1

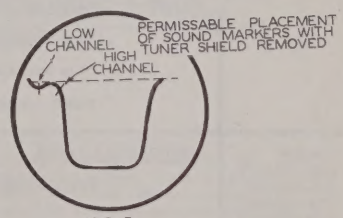

FIG. 3

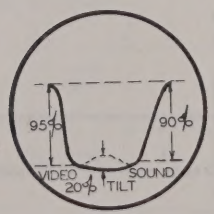

FIG. 2

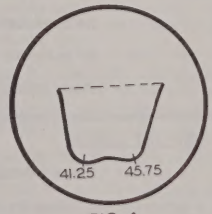

FIG. 4

ANDREA MODELS C-V021, MC-V021, T-V021 (Ch. VN21, V021)

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Merely insert the corresponding folder on this model in this envelope to retain proper filing and indexing order.

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ANDREA MODELS C-V021, MC-V021, T-V021 (Ch. VN21, V021)

ANDREA MODEL C-V021 (Ch. VN21)

TRADE NAME	Andrea Models C-V021 (Ch. VN21), C-V021, MC-V021, T-V021 (Ch. V021)
MANUFACTURER	Andrea Radio Corp., 27-01 Bridge Plaza North, Long Island City, N.Y.
TYPE SET	Television Receiver
TUBES	Nineteen
POWER SUPPLY	110-120 Volts AC-60 Cycles RATING 1.72 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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RETMA MEMBER

ANDREA MODELS C-V021, MC-V021, T-V021 (Ch. VN21, V021)

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 8 push-on type control knobs and UHF dial from front panel of cabinet.

2. Remove 10 wood screws. Unplug antenna leads. Remove rear cover.

3. Disconnect speaker leads.

4. Remove 2 speaker nuts. Remove speaker (on table model only, not necessary on console.)

5. Remove 4 chassis bolts. Remove chassis.

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MODEL	CHASSIS
C-V021	VN21
C-V021, MC-4021, T-V021	V021

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

For touch-up adjustment of VHF tuner oscillator adjustments, it is necessary to remove the chassis from the cabinet. (See disassembly instructions).

PICTURE TUBE SAFETY GLASS CLEANING

To clean safety glass remove 4 phillips head screws holding glass retaining strip at the bottom edge of the safety glass. Remove strip and safety glass. Use extreme caution when removing safety glass.

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions.).

SERVICE ADJUSTMENT LOCATION

See tube placement chart on page 5.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

For adjustment of the horizontal oscillator, it is necessary to remove the rear cover and supply power to the set. Adjustment is located on top of chassis. Set the horizontal hold control at the center of its range and adjust the horizontal frequency slug (B1) until picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary slug (A10) located on top of the chassis.

FUSES

One fuse is used for horizontal sweep circuit protection. (For location see tube placement chart).

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

ANDREA MODELS C-V021, MC-V021, T-V021 (Ch. VN21, V021)

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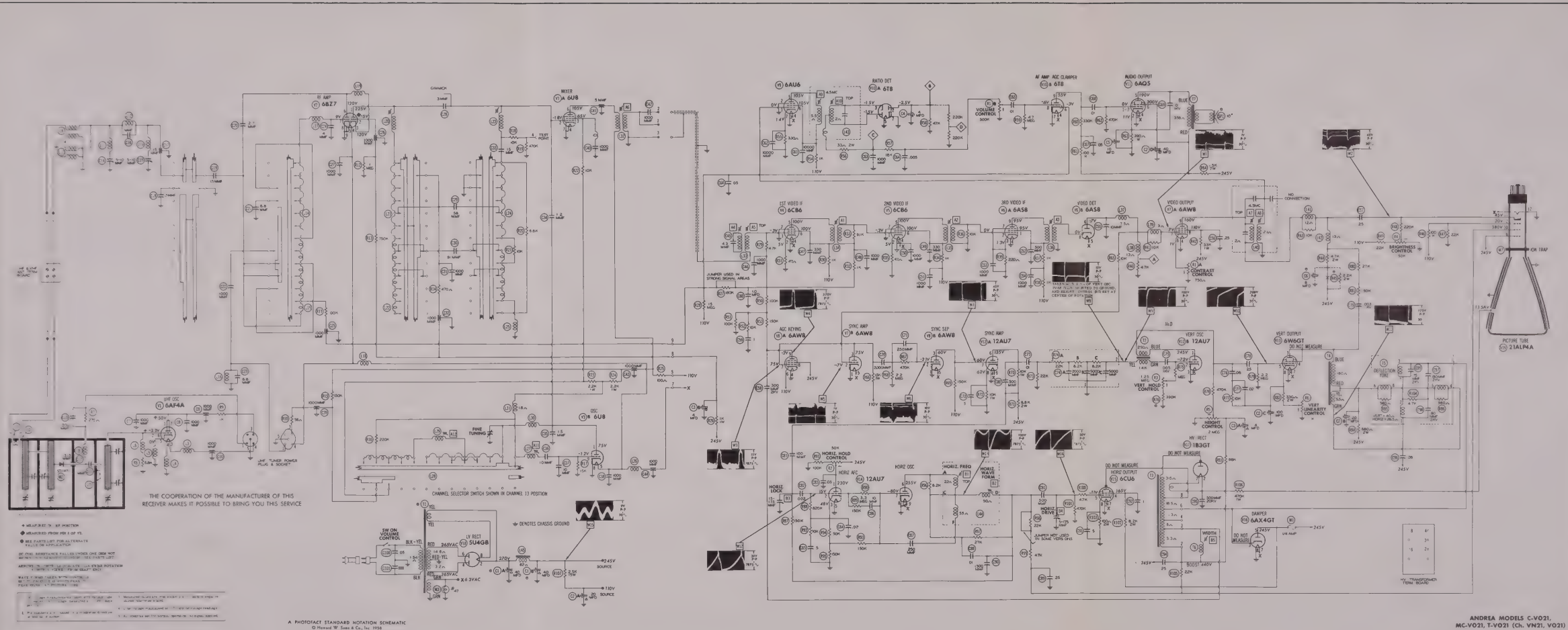
ANDREA MODELS C-V021,
MC-V021, T-V021 (Ch. VN21, V021)
THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
A PHOTOFACT STANDARD NOTATION SCHEMATIC
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ANDREA MODELS C-V021,
MC-V021, T-V021 (Ch. VN21, V021)

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ANDREA MODELS C-VO21,
MC-VO21, T-VO21 (Ch. VN21, VO21)

CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

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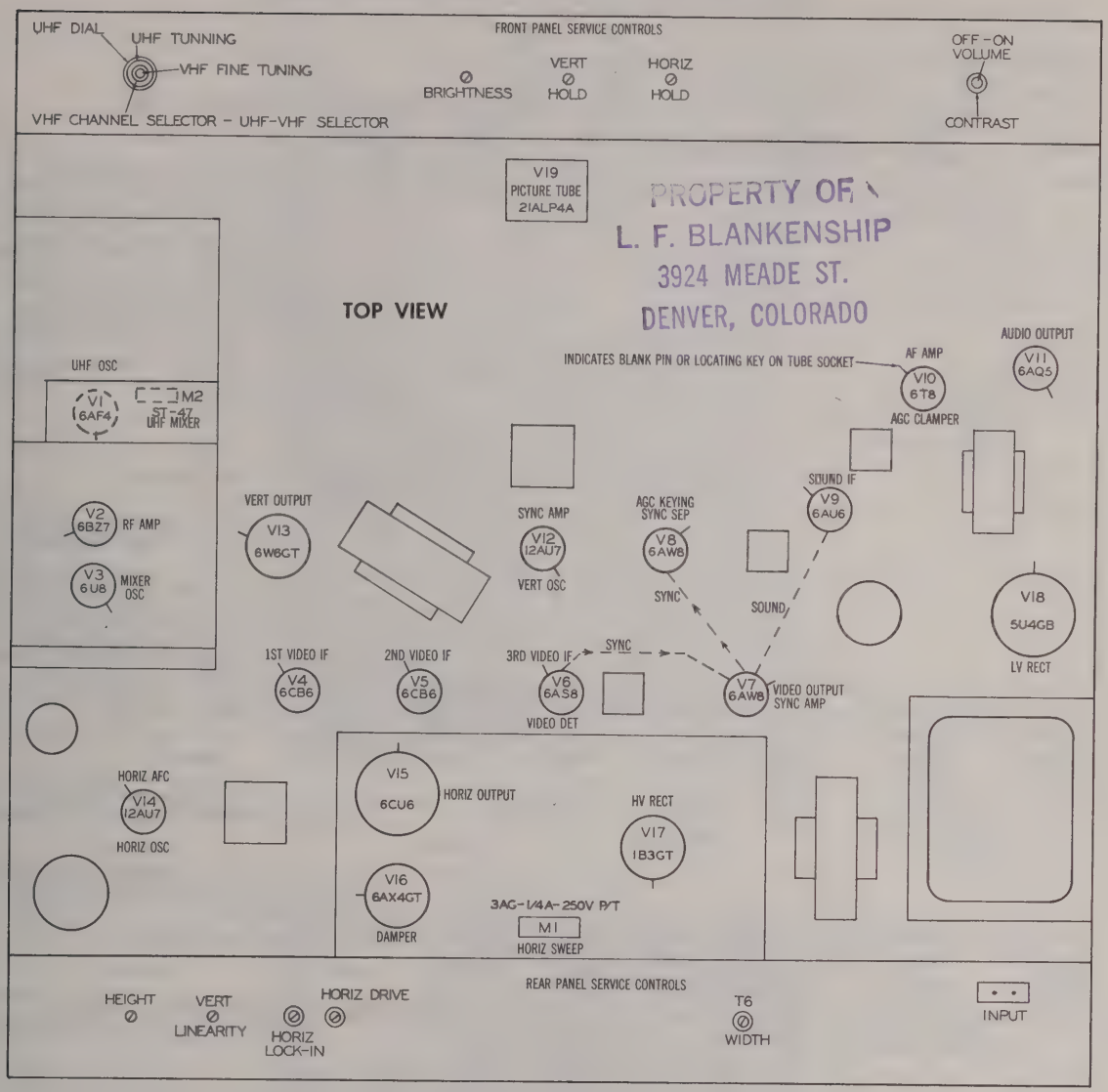
ANDREA MODELS C-VO21,
MC-VO21, T-VO21 (Ch. VN21, VO21)
CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - **V18**

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V3, V4, V5, V6, V7 (V1 UHF only)**
No pic, no sound, has snow - **V1, V2, V3**
No pic, has sound, has raster - **V7, V8, V19**
Has pic, no sound - **V9, V10, V11**
Overloaded picture - **V8, V10**

SYNC FAILURE
No vert. sync - **V12**
No horiz. sync - **V12, V14**
No vert. or horiz. sync - **V7, V8, V12**

SWEEP FAILURE
No raster, has sound - **V14, V15, V16, V17, V19, Fuse (M1)**
No vertical deflection - **V12, V13**
Poor vert. linearity or foldover - **V12, V13**
Poor horiz. linearity or foldover - **V14, V15, V16**
Narrow picture - **V14, V15, V16, V17, V18**
Vert. off freq. - **V12**
Horiz. off freq. - **V12, V14**

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage lead should be securely taped and kept away from chassis.

VIDEO IF ALIGNMENT

Connect the negative side of a 4.5 volt bias supply to the ungrounded side of C60. Connect the positive side to chassis.
Remove the keyed AGC tube (V8) from its socket.
Attenuate the sweep generator output to maintain 2 to 3 volts peak to peak on scope.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	.001MFD	High side to pin 1 (grid) of first video IF amplifier (V4). Low side to chassis.	44MC (10MC Swp)	45.75MC 42.5MC	Between any two channels	Vert. Amp. to point (A). Low side to chassis.	A1, A2, A3	Disconnect L33 from pin 1 (grid) of V4. Adjust A1 to place 45.75MC marker at 50% on high frequency side of response curve. See Fig. 1. Adjust A2 for correct band width with maximum gain. 42.5MC marker should be at 75%. Check position of 45.75MC marker. If necessary, retouch A1. If two peaks are obtained when adjusting A1 and A2 use peak obtained with slug nearest chassis. Adjust A3 for minimum tilt after A1 and A2 are properly adjusted. Reconnect lead of L33 to pin 1 of V4.
2.	Direct	High side to an ungrounded tube shield floating over converter tube (V3). Low side to chassis.	"	41.25MC	"	"	A4	Adjust A4 for proper position of the 41.25MC marker as in Fig. 1.
3.	"	"	"	45.75MC 42.5MC	"	"	A5	Adjust A5 for minimum tilt.
4.	"	"	"	41.25MC	"	"	A6	Adjust A6 until the 41.25MC marker is not more than 1% of the overall response as in Fig. 1.
5.	"	"	"	45.75MC 42.5MC 41.25MC	"	"		Check for response curve similar to Fig. 1. If necessary, retouch A1 thru A3 for desired response. A1 affects 45.75MC marker. A2 affects low frequency side and position of 42.5MC marker and A3 affects tilt. Replace V8 in its socket.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect two matched 220KΩ resistors in series from point (B) to chassis. The junction of these two resistors is alignment point (D) as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
6.	.01MFD	High side to pin 7 (grid) of video output tube (V7A). Low side to chassis.	4.5MC (Unmod)	Any non-interfering channel	DC probe to point (B). Common to chassis.	A7, A8, A9	Adjust for maximum deflection. Attenuate output on VTVM for approximately 40 volts by varing setting of contrast control.
7.	"	"	"	"	DC probe to point (C). Common to point (D).	A10	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
6.	.01MFD	High side to pin 7 (grid) of video output tube (V7A) Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any non-interfering channel	Vert. Amp. to point (B). Low side to chassis.	A7, A8, A9	Disconnect stabilizing capacitor (C4). Adjust for curve of maximum amplitude and symmetry similar to Fig. 2.
7.	"	"	"	"	"	Vert. Amp. to point (C). Low side to chassis.	A10	Reconnect C4. Adjust so that 4.5MC occurs at center of crossover lines as in Fig. 3. SLIGHTLY retouch A9 for maximum amplitude and straightness of crossover lines

VHF OSCILLATOR ADJUSTMENT

Set the fine tuning control the center of its range. Set the channel selector switch to the highest high band (7-13) station operating in the area. Adjust the high band oscillator adjustment (A11) for best picture detail.
Set the channel selector switch to the highest low band channel (2-6) operating in the area. Adjust the low band oscillator adjustment (A12) for best picture detail. Recheck the setting of A11 and if its has changed repeat entire procedure.

VHF RF AND MIXER ALIGNMENT

The RF and mixer portions of this tuner have been properly aligned at the factory and is very stable. Alignment of this portion should not be required in the field.

UHF TUNER ALIGNMENT

In the event the UHF oscillator tube is replaced, it is recommended that several tubes be tried and the one which works best should be used. Alignment of the tuner should not be required in the field.

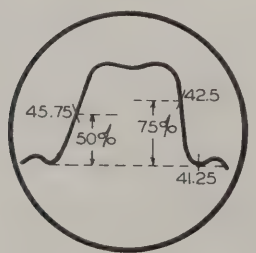


FIG. 1

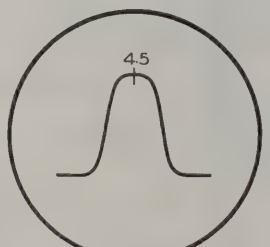


FIG. 2

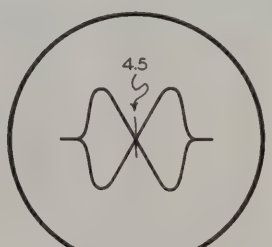
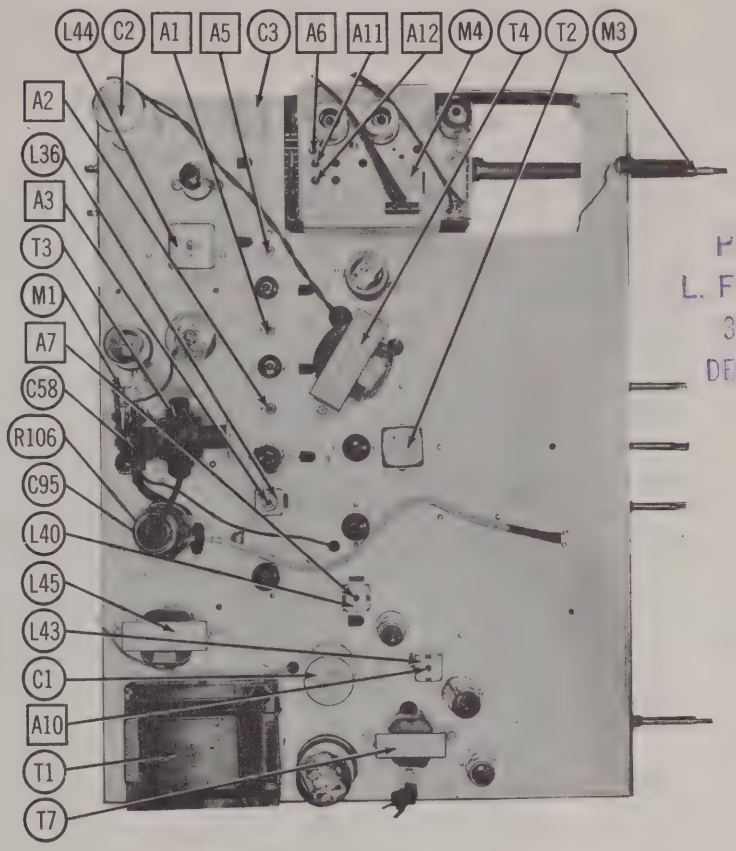
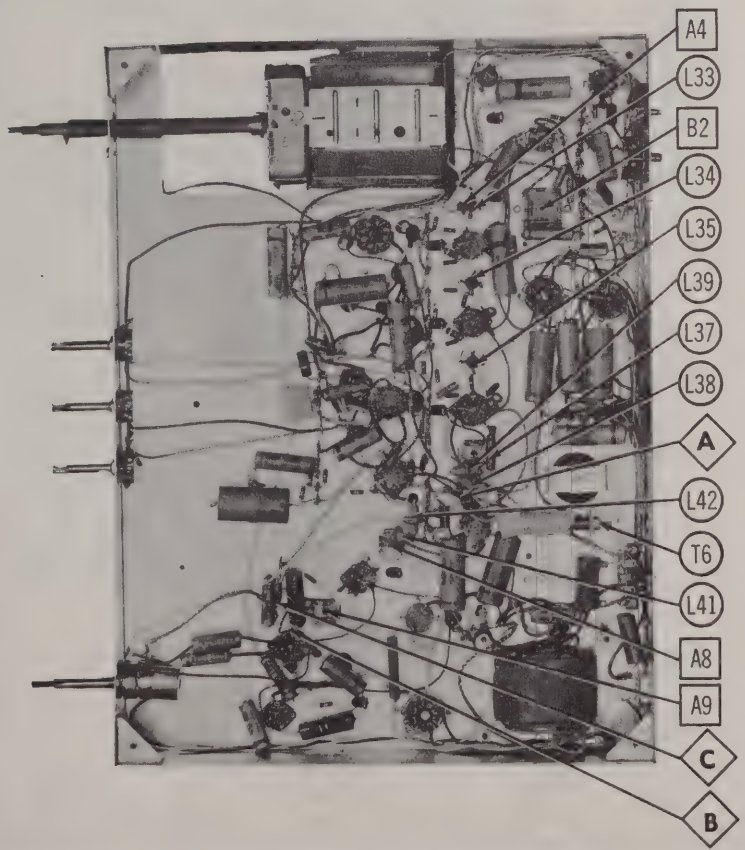


FIG. 3



PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

CHASSIS TOP VIEW

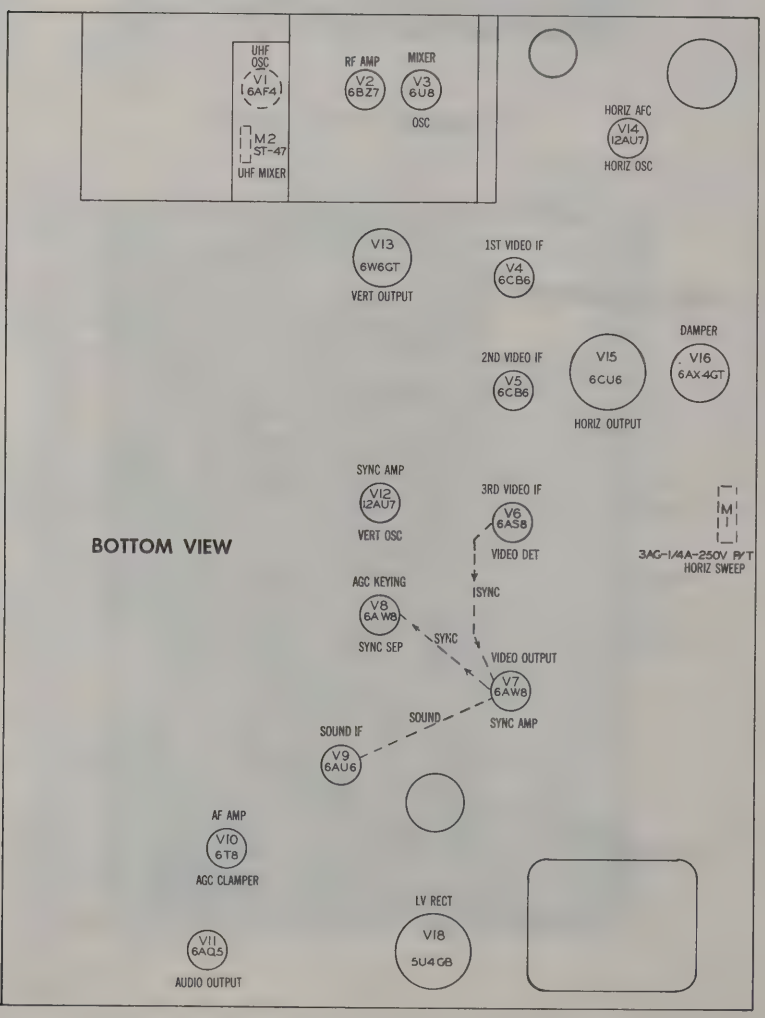


CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AF4A	*† 8KΩ	6. 8KΩ	. 1Ω	0Ω	0Ω	6. 8KΩ	*† 8KΩ		
V 2	6BZ7	† 1. 5KΩ	500KΩ	INF	. 1Ω	0Ω	INF	300KΩ	0Ω	0Ω
V 3	6U8	† 4. 8KΩ	480KΩ	† 17KΩ	0Ω	. 1Ω	† 2. 6KΩ	0Ω	0Ω	15KΩ
V 4	6CB6	200KΩ	47Ω	0Ω	. 1Ω	† 3. 5KΩ	† 3. 5KΩ	0Ω		
V 5	6CB6	200KΩ	47Ω	0Ω	. 1Ω	† 3. 5KΩ	† 3. 5KΩ	0Ω		
V 6	6AS8	† 4. 5KΩ	. 1Ω	220Ω	0Ω	. 1Ω	4. 7KΩ	220Ω	. 2Ω	† 4. 5KΩ
V 7	6AW8	0Ω	15KΩ	† 18KΩ	0Ω	. 1Ω	60Ω	4. 7KΩ	† 33KΩ	† 4. 7KΩ
V 8	6AW8	0Ω	2. 7Meg	† 150KΩ	0Ω	. 1Ω	† 2. 5KΩ	† 18KΩ	62Ω	250KΩ
V 9	6AU6	2. 1Ω	0Ω	0Ω	. 1Ω	† 3. 5KΩ	† 3. 5KΩ	330Ω		
V 10	6T8	550KΩ	47KΩ	550KΩ	. 1Ω	0Ω	200KΩ	0Ω	4. 7Meg	† 450KΩ
V 11	6AQ5	470KΩ	370Ω	0Ω	. 1Ω	† 1. 9KΩ	† 1. 5KΩ	470KΩ		
V 12	12AU7	◓ 750KΩ	2Meg	0Ω	0Ω	0Ω	† 17KΩ	† 150KΩ	10KΩ	. 1Ω
V 13	6W6GT	NC	0Ω	† 900Ω	† 900Ω	2. 2Meg	NC	. 1Ω	1KΩ	
V 14	12AU7	† 5KΩ	1Meg	300KΩ	0Ω	0Ω	◓ 70KΩ	300KΩ	0Ω	. 1Ω
V 15	6CU6	TP	0Ω	TP	† 8. 2KΩ	470KΩ	TP	. 1Ω	100Ω	TOP CAP ◓ 19Ω
V 16	6AX4GT	NC	NC	1. 2Meg	NC	† 62Ω	TP	. 1Ω	0Ω	
V 17	1B3GT		PINS	1-8	HAVE	INF	RESISTANCE			TOP CAP ◓ 334Ω
V 18	5U4GB	TP	40KΩ	NC	13Ω	NC	15Ω	NC	40KΩ	
V 19	21ALP4A	. 1Ω	† 45KΩ	PIN 6 † 62Ω	PIN 10 ◓ 22KΩ	PIN 11 † 270KΩ	PIN 12 0Ω			

* MEASURED IN UHF POSITION.
† MEASURED FROM PIN 2 OF V18.
◓ MEASURED FROM PIN 3 OF V16.
TP-TIE POINT
NC-NO CONNECTION



TUBE PLACEMENT CHART

PROPERTY OF
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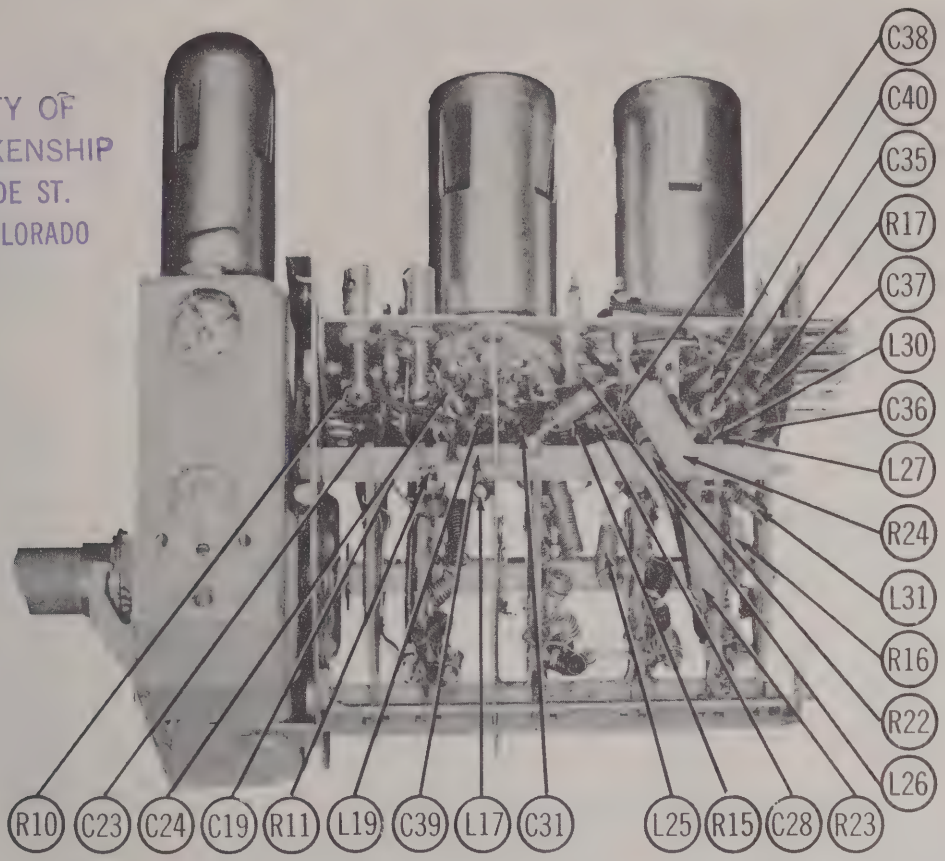
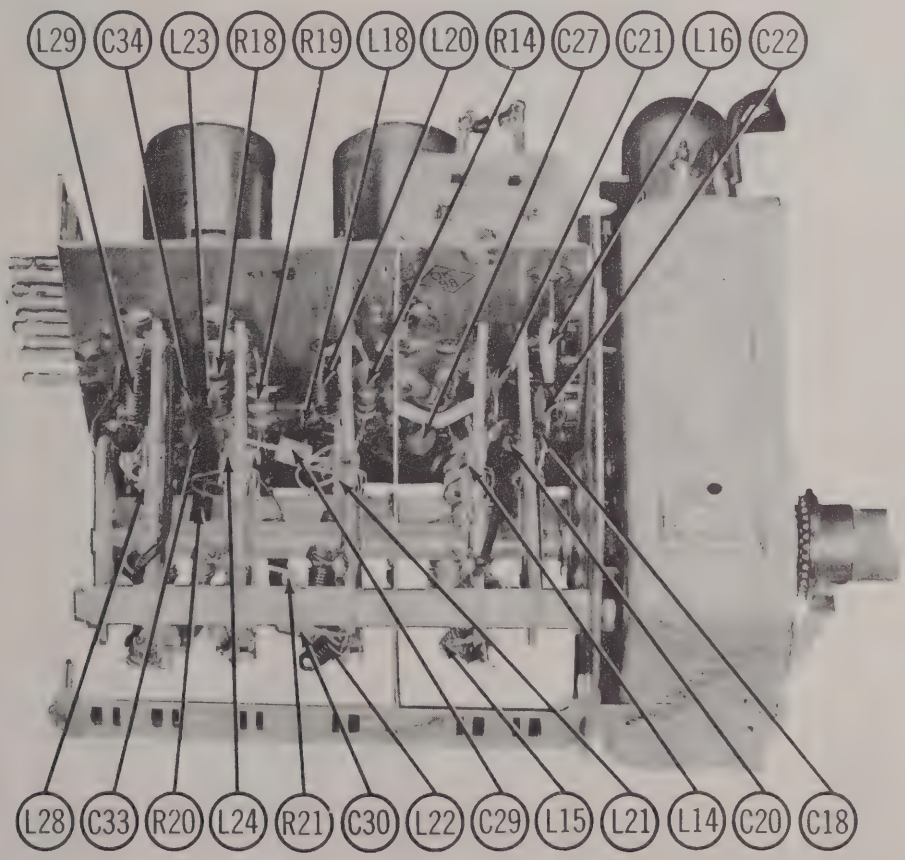
3924 MEADE ST.
DENVER, COLORADO



RF TUNER-RIGHT SIDE



RF TUNER-LEFT SIDE

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No	USE	REPLACEMENT DATA: ANDREA PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	UHF Osc.	6AF4A	6AF4A	TDK	
V2	RF Amp.	6BZ7	6BZ7	9AJ	
V3	Osc.-Mixer	6U8	6U8	9AH	
V4	1st. Video IF Amp.	6CH6	6CH6	TCM	
V5	2nd. Video IF Amp.	6CH6	6CH6	TCM	
V6	3rd. Video IF Amp.				
V7	Video Det. Video Output- Sync Amp.	6AS8	6AS8	8DB	
V8	AGC Keying- Sync Sep.	6AW8	6AW8	8DX	
V9	Sound IF Amp.	6AU8	6AU6	T8K	
V10	Ratio Det.- AF Amp.- AGC Clamper	6T8	6T8	8E	
V11	Audio Output	6AQ5	6AQ5	T8X	
V13	Sync Amp.- Vert. Osc.	12AU7	12AU7	9A	
V13	Vert. Output	6W6GT	6W6GT	TAC	
V14	Horiz. AFC- Horiz. Osc.	12AU7	12AU7	9A	
V15	Horiz. Output	6CU6	6CU6	6AM	
V16	Damper	6AX4GT	6AX4GT	4CG	
V17	HV Rectifier	1B3GT	1B3GT	8C	
V18	LV Rectifier	5U4GB	5U4GB	5T	

CATHODE-RAY TUBE

ITEM No	REPLACEMENT DATA: ANDREA PART No.	CBS	GENERAL ELECTRIC	SYLVANIA	WESTINGHOUSE	RETMA BASE TYPE	NOTES
		PART No.	PART No.	PART No.	PART No.		
V19	21ALP4A ①	21ALP4A ① 21ALP4	21ALP4A ①	21ALP4A② 21ALP4 21ALP4A/B ②	21ALP4A ① 21ALP4	12L 12L	① Aluminized ② Silver screen "55"

ELECTROLYTIC CAPACITORS

ITEM No	RATING: CAP	RATING: VOLT	REPLACEMENT DATA: ANDREA PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	±40	450	ECE-1340 (Note B)	AFE3-57	B045	FP338	TM-D40-450	D-335	TVL-3764
B	±40	450	(Note B)						
C2A	±20	350	ECE-1339		D053		TM-3057	T-819	TVL-4740
B	±20	525			BR3050		TD-20-500	D-608	TVA-1906
C	100	25							
D	±40	450							
C3A	±4	500	ECE-1341	AFE3-67	B049	WP230.9	TM-DID-500	T-300	
B	±4	500							
C4	3	25	ECE-1302	PR330V3	BR83-507	TC303	TD-3-25	MMT-0505	TVA-1201
C5	10	25	ECE-1339	PR325V10	BR103	TC23	TD-10-25	FM-0310	TVA-1304
C6	9	450	(Note 2	PR450V9	BR845	TC71	TD-8-450	FM-4508	TVA-1704

Note 1. Chassis operating on 50% use 60MPD in this application.
Note 2. Used only in chassis operating on 50%.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: ANDREA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C7	1000			BPD-001	DD-103	KD69	801-001	DC-531	5HK-D1	
C8	1000			BPD-001	DD-103	KD69	801-001	DC-531	5HK-D1	
C9	1000			EF-001	MFT-1000				503C-D1	
C10	1000			EF-001	MFT-1000				503C-D1	
C11	1.1			MPG-S2	TCZ-1	TZ03	MPGA-010		5TCCB-V1	
C12	3.3									
C13	1000			BPD-001	DD-103	KD69	801-001	DC-531	5HK-D1	
C14	5-30									
C15	5-30									
C16	150			BPD-000015	DD-151	G046	811-151	UC-5315	5GA-T15	
C17	15									
C18	15			BPD-000015	DD-150	GG21	831-150	UC-5415	5GA-Q15	
C19	15			BPD-000015	DD-150	GG21	831-150	UC-5415	5GA-Q15	
C20	2.7									
C21	6.8			MPG-S2.8	TCZ-5R8	Z013	MPGA-5R8	ET-5565	5TCCB-V68	
C22	1000			BPD-001	DD-102	KD69	801-001	DC-531	5HK-D1	
C23	6.8			MPG-S2.8	TCZ-5R8	Z013	MPGA-5R8	ET-5565	5TCCB-V68	
C24	4									
C25	1000			EF-001	MFT-1000				503C-D1	
C26	1000			EF-001	MFT-1000				503C-D1	
C27	1000			BPD-001	DD-103	KD69	801-001	DC-531	5HK-D1	
C28	.8									
C29	.86									
C30	.86									
C31	1000			BPD-001	DD-103	KD69	801-001	DC-531	5HK-D1	
C32	1000			EF-001	MFT-1000				503C-D1	
C33	15			BPD-000015	DD-150	GG21	831-150	UC-5415	5GA-Q15	
C34	1.3									
C35	1.8									
C36	10									
C37	10									
C38	1000			BPD-001	DD-103	KD69	801-001	DC-531	5HK-D1	
C39	1000			EF-001	MFT-1000				503C-D1	
C40	1000			BPD-001	DD-103	KD69	801-001	DC-531	5HK-D1	
C41	5									
C43	1000			BPD-001	DD-103	KD69	801-001	DC-531	5HK-D1	
C43	1000			EF-001	MFT-1000				503C-D1	
C44	1000			EF-001	MFT-1000				503C-D1	
C45	43			TCZ-43	TZ21	MPGL-430				
C46	1000		HCC-1950	BPD-001	DD-103	KD69	801-001	DC-531	5HK-D1	
C47	330		EI330	D6-331	TP43	GP2K-331	UC-5333	5GA-T33		
C48	1000		HCC-1950	BPD-001	DD-103	KD69	801-001	DC-531	5HK-D1	
C49	330		HCC-1949	D6-331	TP43	GP2K-331	UC-5333	5GA-T33		
C50	1000		HCC-1950	BPD-001	DD-103	KD69	801-001	DC-531	5HK-D1	
C51	1000		HCC-1950	BPD-001	DD-103	KD69	801-001	DC-531	5HK-D1	
C52	500	600	HCM-1625A	EI500	D6-501	5WS75	GP2K-501	MC345	1FM-35	
C53	1000		HCC-1950	BPD-001	DD-103	KD69	801-001	DC-531	5HK-D1	
C54	1000		HCC-1950	BPD-001	DD-103	KD69	801-001	DC-531	5HK-D1	
C55	15		HCC-1923	NT50-ED0	TCN-15	TN01	NT50A-100	NT-541	5TCU-q1	
C56	.35	400	HCC-1915	P486N-35		CUB4P25		PT0325	47M-P25	
C57	.35	400	HCC-1915	P486N-35		CUB4P25		PT0325	47M-P25	

CAPACITORS (cont)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: ANDREA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C58	300	3000	HCM-1615CBX	HVD-30-3S1	DD30-301	V2T33		MCL330	30GA-T3	
C59	.1	300	HCT-1013	P288N-1	DF-104	CUB2P1		PT401	2TM-P1	
C60	1.0	100	HCT-1037-1	P288N-1.0		CUB2W1		PT41	2TM-M1	
C61	10000		HCC-1943	BPD-01	DD-103	K083	811-01	DC-511	5HK-B1	
C62	10000		HCC-1943	BPD-01	DD-103	K082	811-01	DC-511	5HK-B1	
C63	1000		HCC-1950	BPD-001	DD-103	K069	801-001	DC-521	5HK-D1	
C64	.005	600	HCT-1017	EI5000	D6-503	CUBMD5	GP3-333-503	PT625	5TM-D5	
C65	.01	600	HCT-1030	BPD-01	DD-103	CUBMD1	GP3-333-103	PT61	5TM-B1	
C66	.05	400	HCT-1003	BPD-05	DF-503	CUB4S5		PT615	4TM-S5	
C67	.05	400	HCT-1003	BPD-05	DF-503	CUB4S5		PT615	4TM-S5	
C68	.01	900	HCT-1006	BPD-01	D6-103	CUBS81	GP3-333-103	PT61	5TM-S5	
C69	.01	1000	HCT-1009	EI05BN-1	DD-103	CUBU81		PT61	M3-B1	
C70	1000		HCC-1944	BPD-005	DD-503	K073	801-003	DC-532	5HK-D3	
C71	250	300	HCM-1634C	SI250	D6-251	5WS725	GP2K-251	MC340	1FM-325	
C72	.5	300	HCT-1035	P288N-5		CUB2P5		PT405	2TM-P5	
C73	.01	900	HCT-1006	BPD-01	DE-103	CUBS81	GP3-333-103	PT61	5TM-S1	
C74A	2000							DC-522		
B	5000		4FM-5389	4PA-1H	4PC-100	4HS73M1	4S408-01	DC-525	4V-1	
C	5000							DC-525		
C75	.005	1000	HCT-1025							
C76	.05	600	HCT-1029							
C77	.02	600	HCT-1030	BPD-03	DD-303	CUBMD3	417-03	PT613	5TM-S3	
C78	.25	400	HCT-1015	P486N-25		CUB4P25		PT0325	47M-P25	
C79	.003	1000	HCT-1021	HVD-15-3S00	DD-302	CUBMD3	1R5KV-332	PT1023	M3-D3	
C80	500	500	HCM-1625A	SI500	D6-501	5WS75	GP2K-501	MC345	1FM-35	
C81	500	500	HCM-1625A	SI500	D6-501	5WS75	GP2K-501	MC345	1FM-35	
C82	.002	400	HCT-1036	SI2000	D6-202	CUBMD2	GP3-333-202	PT623	5TM-D2	
C83	.05	400	HCT-1003	BPD-05	DF-503	CUB4S5		PT615	4TM-S5	
C84	.03	600	HCT-1030	BPD-03	DD-303	CUBMD3	417-03	PT613	5TM-S3	
C85	.5	200	HCT-1033	P288N-5		CUB2P5		PT405	2TM-P5	
C86	10	500	HCM-1634A	SI10	D6-100	5WS710	GP1K-100	MC315	1FM-41	
C87	250	500	HCM-1624C	I469-00035		5RS725		MCH240	1FM-325	
C88	.01	600	HCT-1006							
C89	.35	400	HCT-1015	P488N-35		CUB4P25		PT0325	57M-P25	
C90	1000	500	HCM-1618A	SI1500	D6-152	5WS215	GP2L-152	MC355	1FM-315	
C91	500	500	HCM-1625A	SI500	D6-501	5WS75	GP2K-501	MC345	1FM-35	
C92	.1	600	HCT-1003	P488N-1	DF-104	CUB4P1		PT601	5TM-P1	
C93	.5	200	HCT-1033	P288N-5		CUB4P5		PT405	2TM-P5	
C94	.35	400	HCT-1015	P488N-35		CUB4P25		PT0325	57M-P25	
C95	500	3000	HCH-1706-1	UV-502	TV3-502	MMU30T5	413	HV30G35A	30DK-T5	
C96	.08	600	HCT-1029			5WS4Q	GP1K-100	MC315		
C97	150	1000	HCM-1613	HVD30-150	DD30-151	V2T15	3KV-151		30GA-T15	
C98	150	2000	HCM-1613	HVD30-150	DD30-151	V2T15	3KV-151		30GA-T15	
C99	75	3000	HCM-1635		DD30-750				30GA-Q75	
C100	.05	400	HCT-1003	BPD-05	DF-503	CUB4S5		PT615	4TM-S5	
C101	.05	400	HCT-1003	BPD-05	DF-503	CUB4S5		PT615	4TM-S5	

* Items C74A, C74B, C74C, R74A, R74B and R74C are combined in one unit.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: ANDREA PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	750Ω	½	GRV-845	F3-3	RTV-546	QJ-571 +	UF13R	Contrast (Panel)
B	500KΩ	½		R4-41			UR45A	Volume (Rear)
C	Shaft			KB-1			US-28	Attach to R1B.
R2A	50KΩ	½	GRV-847	AB-31	A47-50K-S	QJ-123	U-35	Horizontal Hold
B	Shaft		Not Req.	AK-4	KB3-5	Not Req.	Not Req.	Attach to R2A.
R3A	1.25Meg	½	GRV-846	AB-742	A47-1.5Meg§	QJ-133	U-158	Vertical Hold
B	Shaft		Not Req.	AK-4	KB3-5	Not Req.	Not Req.	Attach to R3A.
R4A	50KΩ	½	GRV-847	AB-31	A47-50K-S	QJ-123	U-35	Brightnes
B	Shaft		Not Req.	AK-4	KB3-5	Not Req.	Not Req.	Attach to R4A.
R5A	1Meg	½	GRV-848	AB-75	A47-3Meg-S	QJ-137	TA5R1	Height
B	Shaft		Not Req.	AK-1	FK8-1/4	Not Req.	Not Req.	Attach to R5A.
R6A	100Ω	½	GRV- 849	AB-129	A43-100Ω	WP230Ω	R100U1	Vertical Linearity (Wire Wound)
B	Shaft		Not Req.	Not Req.	FK8-1/4	Not Req.	Not Req.	Attach to R6A.

+ Concentrikit Equivalent; K-4 Kit, Base Elements and Shafts; B1T-105, P6-130 (Panel)
B13-133, R1-230 (Rear)
S6-1 (Switch)

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: ANDREA PART No.	IRC PART No.	NOTES
R7	270Ω	½			
R8	680Ω	½		BTS-680Ω	
R9	1000Ω	½		BTS-1K0Ω	
R10	50Ω	½		BTS-50	
R11	100KΩ	½		BTS-100K	
R12	1Meg 5%	½		BTS-1M0 5%	
R13	750Ω 5%	½		BTS-750Ω 5%	
R14,	470Ω	½		BTS-470	
R15	150KΩ	½		BTS-150K	
10B	230KΩ	½		BTS-220K	
R17	15KΩ	½			
R18	10KΩ	½		BTS-10K	
R19	470KΩ	½			
R20	680Ω	½			
R21	10KΩ	½		BTS-10K	
R22	10KΩ	½		BTS-10K	
R23	2200Ω	1		BTA-2200	
R24	2300Ω	1		BTA-2300	
R25	100Ω	1		BTS-100	
R26	1000Ω	1	GRC-351	BTA-1000	
R27	180KΩ	1	GRC-336	BTS-180K	
R28	15Meg	1	GRC-337	BTS-15M0	
R29	470Ω	1	GRC-305		
R30	1000Ω	1	GRC-12	BTS-1000	
R31	47Ω	1	GRC-311	BTS-47	
R32	1000Ω	1	GRC-352	BTS-1000	
R33	2200Ω	1	GRC-335		
R34	1000Ω	1	GRC-352	BTS-1000	
R35	220Ω	1	GRC-315	BTS-220	
R40	470Ω	1	GRC-305	BTS-470Ω	
R41	10KΩ	1	GRC-304	BTS-10K	
R42	33KΩ	1	GRC-281	BTA-33K	
R43	10KΩ	1	GRC-304	BTS-10K	
R44	4700Ω	3	GRC-336	BTB-4700	Note 1
R45	2300Ω	3		BTB-2300	
R46	100KΩ	½	GRC-258	BTS-100K	
R47	22KΩ	½	GRC-301	BTS-22K	
R48	220KΩ	½	GRC-270	BTS-220K	
R49	22KΩ	½	GRC-301	BTS-22K	
R50	100KΩ	½	GRC-258	BTS-100K	
R51	100KΩ	½	GRC-258	BTS-100K	
R52	10KΩ	½	GRC-304	BTS-10K	
R53	150KΩ	½	GRC-243	BTS-150K	
R54	100Ω	½	GRC-312	BTS-100	
R55	330Ω	½	GRC-329	BTS-330	
R56	33Ω	2	GRC-329		
R57	18KΩ 5%	½	GRC-330	BTS-18K 5%	
R58	47KΩ	½	GRC-307	BTS-47K	
R59	4.7Meg	½	GRC-342	BTS-4.7M0	
R60	330KΩ	½	GRC-301	BTS-330K	
R61	100KΩ	½	GRC-258	BTS-100K	
R62	470KΩ	½	GRC-326	BTS-470K	
R63	390Ω	1	GRC-277	BTA-390	
R64	1500Ω	7	GRW-542	PW7-1500	
R65	10KΩ	½	GRC-304	BTS-10K	
R66	15KΩ	½	GRC-327	BTA-15K	
R67	47KΩ	½	GRC-228	BTS-470K	
R68	2.2Meg	½	GRC-230	BTS-2.2Meg	
R69	150KΩ	½	GRC-243	BTS-150K	
R70	10KΩ	½	GRC-232	BTA-10K	
R71	6800Ω	2	GRC-318	BTB-6800	
R72	10KΩ	½	GRC-232	BTA-10K	
R73	22KΩ	½	GRC-301	BTS-22K	
R74A	22KΩ	½		BTS-22K	
B	8200Ω	½	4FM-5389	BTS-8200	
C	8200Ω	½		BTS-8200	
R75	1Meg	½	GRC-331	BTS-1M0	
R76	390KΩ	½		BTS-390K	Note 2
R77	10KΩ	½	GRC-304	BTS-10K	
R78	470KΩ	½	GRC-228	BTS-470K	
R79	2.2Meg	½	GRC-230	BTS-2.2Meg	
R80	27KΩ	½	GRC-234	BTS-27K	
R81	150KΩ	½	GRC-243	BTS-150K	
R82	330Ω	3	GRC-335	BTB-330	

RESISTORS (cont)

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: ANDREA PART No.	IRC PART No.	NOTES
R83	68KΩ 5%	½	GRC-264	BTS-68K 5%	
R84	680Ω	2	GRC-334	BTB-680	
R85	56Ω	½	GRC-250		
R86	56Ω	½	GRC-250		
R87	150KΩ	½	GRC-243		
R88	820KΩ	½	GRC-246		
R89	150KΩ	½	GRC-243		
R90	3.3Meg	½	GRC-206		
R91	100KΩ	½	GRC-258		
R92	10KΩ	½	GRC-304		
R93	150KΩ	½	GRC-243		
R94	150KΩ	½	GRC-243		
R95	150KΩ	½	GRC-243		
R96	8200Ω	½	GRC-295		
R97	27KΩ	½	GRC-234		
R98	22KΩ 5%	½			
R99	47KΩ	½	GRC-250		
R100	4700Ω	½	GRC-305		
R101	470KΩ	½	GRC-228		
R102	6800Ω	½	GRC-296		
R103	100Ω	2	GRC-325		
R104	470Ω	½	GRC-305		
R105	22KΩ	½	GRC-301	BTS-22K	
R106	470KΩ	½	GRC-309	BTA-470K	
R107	2500Ω	15	GRW-548	RD-2500	

Note 1. Used in 50 cycle models only.
Note 2. Some versions use a 330KΩ ½W resistor in this application.
* C74A, C74B, C74C, R74A, R74B, R74C are combined in one unit.

TRANSFORMER (POWER)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: ANDREA PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC	540VCT	5VAC	6.3VAC	ST-3062					
	g 1.72A	.300ADC	g 3A	g 1A						

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No	USE	REPLACEMENT DATA: ANDREA PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T2	Vert. Osc. Trans.	ST-3066	H6701	A-4003	208T9	V402	A-8123	26A04	A-87T
T3	Horiz. Output Trans.	ST-3063	P3419 *	A-8265 *	209T9	X094 *	A-8265 *	27B17*	D-50 *
T4	Vert. Output Trans.	ST-3064	21G0G① ②	A-8262		V302	A-8142①	26B72	A-102K
T5A	Yoke (90°) Horiz. (58.5MH)	ST-3066	DF507①	MDF-83①	235D1④	T90F18/43	DY-35A①	Y-16①	Y-41-1①
B	Vert. (38MH)					④			
T6	Width Coil (2-9-18MH)	SA-366		MWC-11	212R1③	Z01418 ⑤	WC-8①	WC-18	WC-12 ⑤

① Use 8 to 1 turns ratio.
② Drill new mounting hole(s).
③ Use original horizontal yoke damping network.
④ Use original yoke damping network.
⑤ Enlarge mounting hole.
⑥ Connect to coded red and blue terminals.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type Is Listed

ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
8	9	9	9	9	9	9
6	5	5	5	5	5	5
3	3	3	3	3	3	3
2	1	1	1	1	1	1
Cornet Width Coil Arms	2 & 3	1 & 3	1 & 3	1 & 3	1 & 3	1 & 3

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI	IMPEDANCE: SEC	REPLACEMENT DATA: ANDREA PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T7	4.4KΩ	3.9Ω	ST-3061 ST-3069	Z1008	A-3019	A-3823	24S48	S-8Z	① Used in 50 cycle models.

SPEAKER

ITEM No	RATINGS: SIZE	FIELD	V. C. IMP	REPLACEMENT DATA: ANDREA PART No.	QUAM PART No.	RCA TYPE No	NOTES
SP1	10"	PM	3.9Ω	SL-4019 ①	10A31	236H1	① Used in console models.
	5"	PM	3.9Ω	SL-4018 ②	5A07	203S3	② Used in table models.
	6"	PM	3.9Ω	SL-4020 ③	6A31	209S3	③ Used in consolette models.

COILS (RF-IF)

ITEM No	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: ANDREA PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	UHF Ant. Coil	0Ω						
L2	UHF Ant. Coil	0Ω						
L3	Fil. Choke	0Ω						
L4	Fil. Choke	0Ω						
L5	Cathode Choke	0Ω						
L6	RF Choke	0Ω						
L7	UHF Osc. Coupling Coil	0Ω						
L8	UHF IF Coil	0Ω						
L9	VHF Ant. Matching Trans.	.6Ω	.6Ω					
L10	VHF Ant. Matching Trans.	.6Ω	.6Ω					
L11	IF Trap	.6Ω						
L12	FM Trap	0Ω						
L13	IF Trap	.6Ω						
L14	VHF Ant. Coils	0Ω						
L15	UHF IF Coil	0Ω						
L16	Trap Coil	.3Ω						
L17	VHF Ant. Coil	0Ω						Channel 13
L18	Fil. Choke	0Ω						
L19	Neut. Coil	0Ω						
L20	VHF Ant. Coil	0Ω						Channel 13
L21	VHF RF Coils	0Ω						
L22	UHF IF Coil	0Ω						

ANDREA MODELS C-V021, MC-V021, T-V021 (Ch. VN21, VN21)

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	ANDREA PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L23	VHF Mixer Grid Coil	0Ω						Channel 13
L24	VHF Mixer Grid Coils	0Ω						
L25	UHF IF Coil	0Ω						
L26	Fil. Choke	0Ω						
L27	VHF Osc. Coil	0Ω						Channel 13
L28	VHF Osc. Coils	0Ω						
L29	VHF Osc. Coil	0Ω						Channel 6
L30	Feedback Coil	0Ω						
L31	RF Coil	1.6Ω						
L32	Conv. Plate	.1Ω	.1Ω					
L33	1st Video IF	.1Ω		SA-377		TV-132	6221	Includes 41.25MC Trap
L34	2nd Video IF	.2Ω	.1Ω	SA-378	17-4522	TV-130	6219	
L35	3rd Video IF	.2Ω	.1Ω	SA-379	17-4522	TV-130	6219	
L36	4th Video IF	.1Ω	.2Ω	SA-380	17-5004	TV-125	6234	
L37	Series Peaking Coil	7.5Ω		SA-349			4563	
L38	Shunt Peaking Coil	13Ω		SA-350	19-3300		6132	330 Microhenries
L39	Series Peaking Coil	13Ω		SA-350	19-3300		6132	330 Microhenries
L40A	4.5MC Trap	2Ω		SA-373				
B	Sound IF	2.1Ω						
L41	Series Peaking Coil	12Ω		SA-364	19-3250	TV-185	6130	270 Microhenries
L42	Shunt Peaking Coil	13Ω		SA-350	19-3300		6132	330 Microhenries
L43	Ratio Det.	5.5Ω	2ΩCT	SA-374	17-3497	TV-115	6205	Tertiary Winding=.6Ω

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES.		REPLACEMENT DATA							NOTES
	PRI.	SEC.	ANDREA PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	RCA TYPE No.	Ram PART No.	Thordarson PART No.	
L44	22Ω	55Ω	SA-335	20-1402 *	TV-162 *	6183 *	205R1 *	H-100 *	HS-3 *	Waveform Winding 50Ω

* Reverse coil mounting in can.

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA					
	TOTAL DIRECT CURRENT	D.C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 ∿)	ANDREA PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L45	.300ADC	62Ω	1.98Ω	ST-3065	C5037 ①	C-2996 ①	C-2326 ①	26C44	C-17X ①

① Drill one new mounting hole.

FUSES

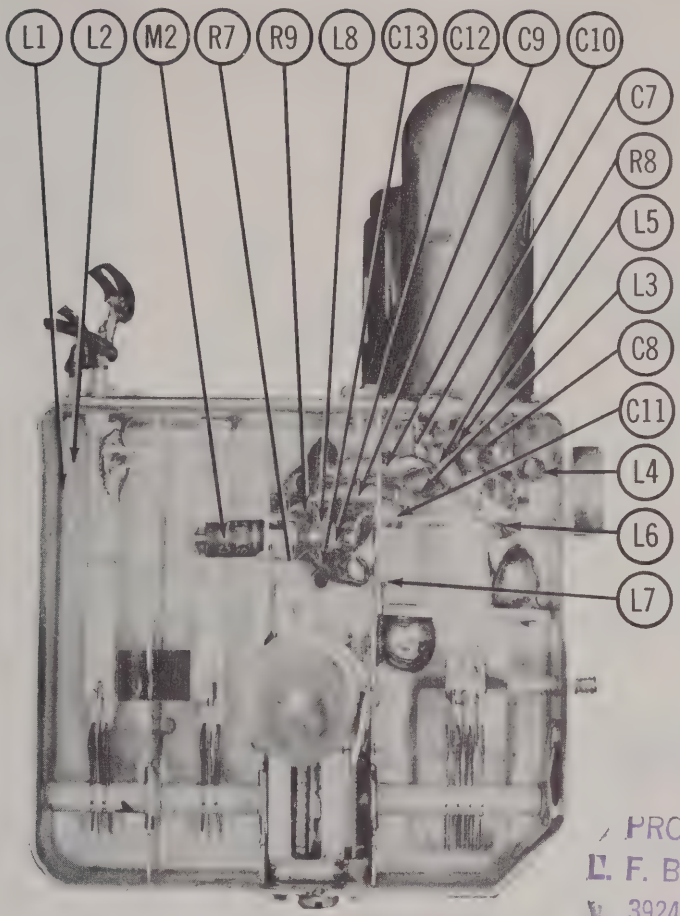
ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			ANDREA PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG P/T	1/4A 250V			318.250 (3AG P/T 1/4A)		GJV 1/4	

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA		NOTES
		ANDREA PART No.	SYLVANIA PART No.	
M2	ST-47		1N82 or 1N82A	UHF Mixer

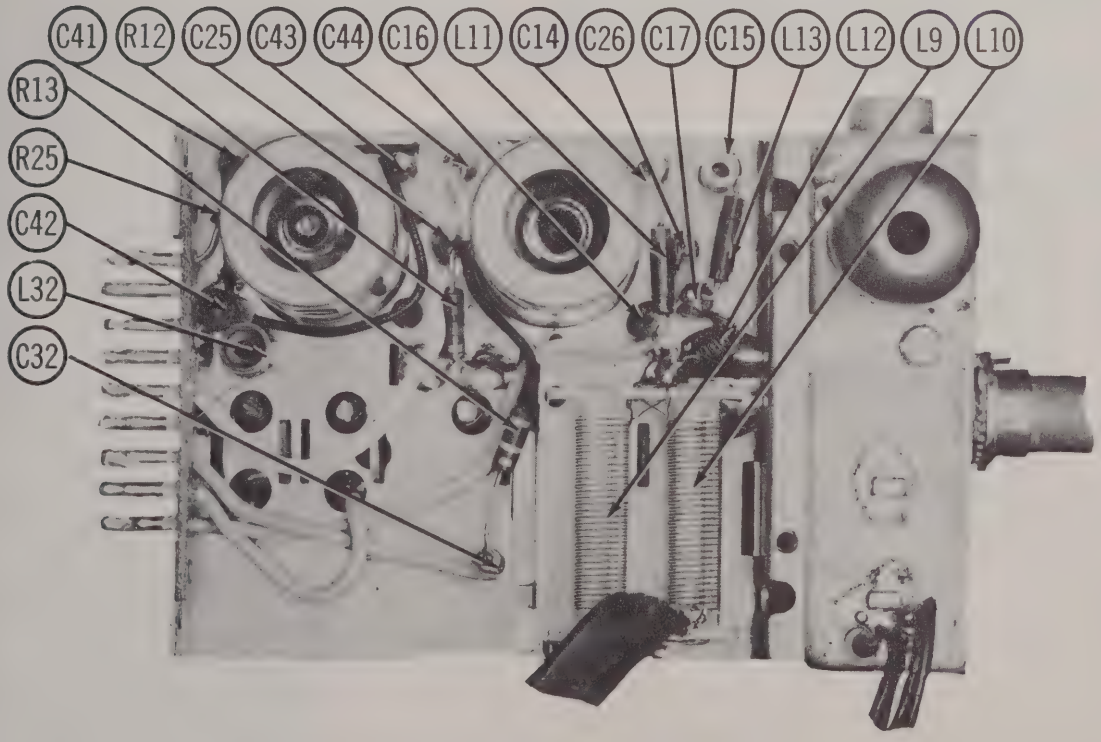
MISCELLANEOUS

ITEM No.	PART NAME	ANDREA PART No.	NOTES
M3	Dial Light		#47
M4	Tuner	FM-5325-V	VHF-UHF - Chassis VN21
M5	Tuner	FM-5324	VHF - Chassis VO21
M6	Centering Device	ST-3067	
M7	Ion Trap	FM-5315	
B3	Trimmer Cap.	HCV-2123	Horiz. lock (15-175MMF)
B4	Trimmer Cap.		Dual - Horiz. Drive (15-175MMF)
	Knob	FM-5329M	Horiz. Hold, vert. hold, and brightness
	Knob	FM-5330	Contrast
	Knob	FM-5331	On-off-volume
	Knob	FM-5333	Fine tuning
	Knob	FM-5332	Channel selector - used on VHF chassis only
	Knob	FM-5334	UHF tuning - used on VHF-UHF chassis
	Knob	FM-5336	Channel selector with prism for UHF tuning - used on VHF-UHF chassis
	Dial	FM-5335	UHF tuning - used on VHF-UHF chassis
	Safety Glass	FM-5327	Table models
	Safety Glass	FM-5328	Console models
	Mask	EP-842	Table models
	Mask	EP-843	Console models

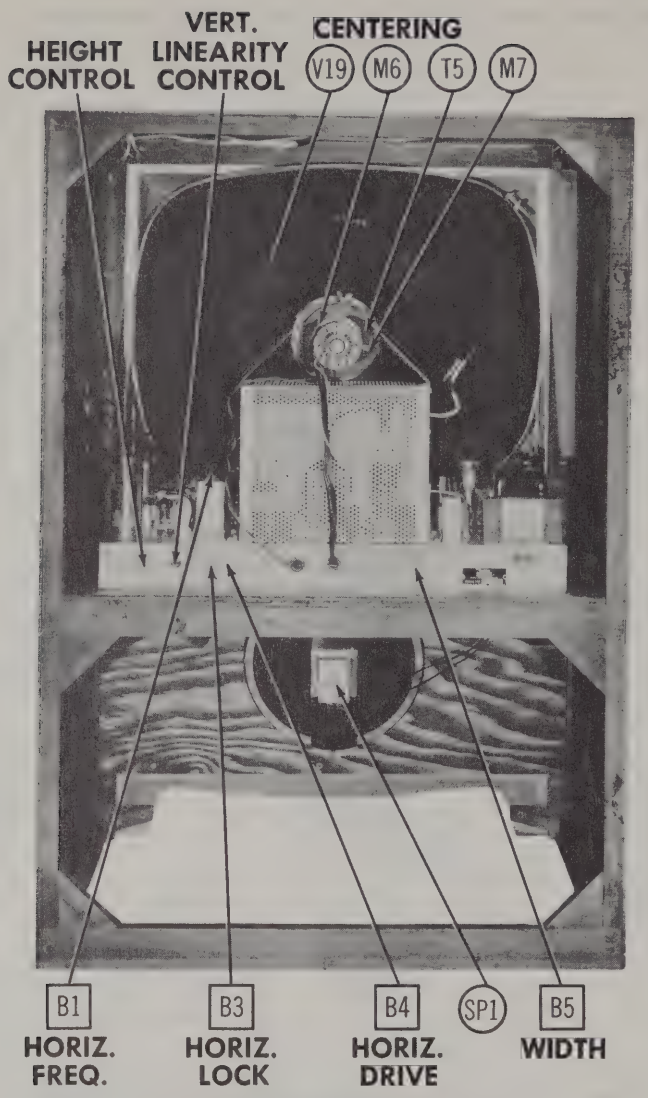


UHF TUNER FRONT VIEW

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO



RF TUNER TOP VIEW



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern.

Set the horizontal lock-in trimmer (B3) to 1/4 turn from fully clockwise position. Set the horizontal drive trimmer (B4) to 1/4 turn from fully clockwise.

Set the horizontal frequency slug (B1) so that one inch of screw protrudes from can.

Set the horizontal waveform slug (B2) 3 turns from full counter clockwise position.

Connect the low capacity probe of oscilloscope to terminal "C" of the horizontal oscillator transformer (L44). Connect the low side of scope to chassis.

Turn brightness control and horizontal hold control fully clockwise.

Adjust B1 until picture holds sync.

Adjust B2 so that the broad and narrow peaks of the waveform on scope are of equal height as in Fig. 4.

Adjust brightness control until picture just becomes visible. Check the horizontal hold control range. If it is less than 120 degrees adjust B2 until range is at least 120 degrees.

Turn the brightness control and horizontal hold control fully clockwise and if necessary adjust B1 until picture is just in sync.

Adjust the horizontal drive trimmer (B4) counter clockwise as far as possible without the presence of vertical white lines or compression near center of picture. Adjust the width slug (B5) for a picture slightly wider than necessary to fill the picture mask horizontally.

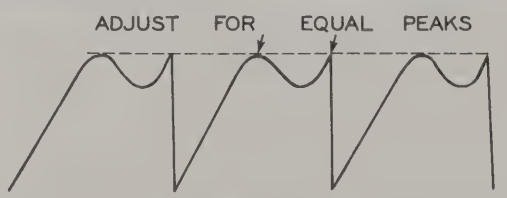


FIG. 4

L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

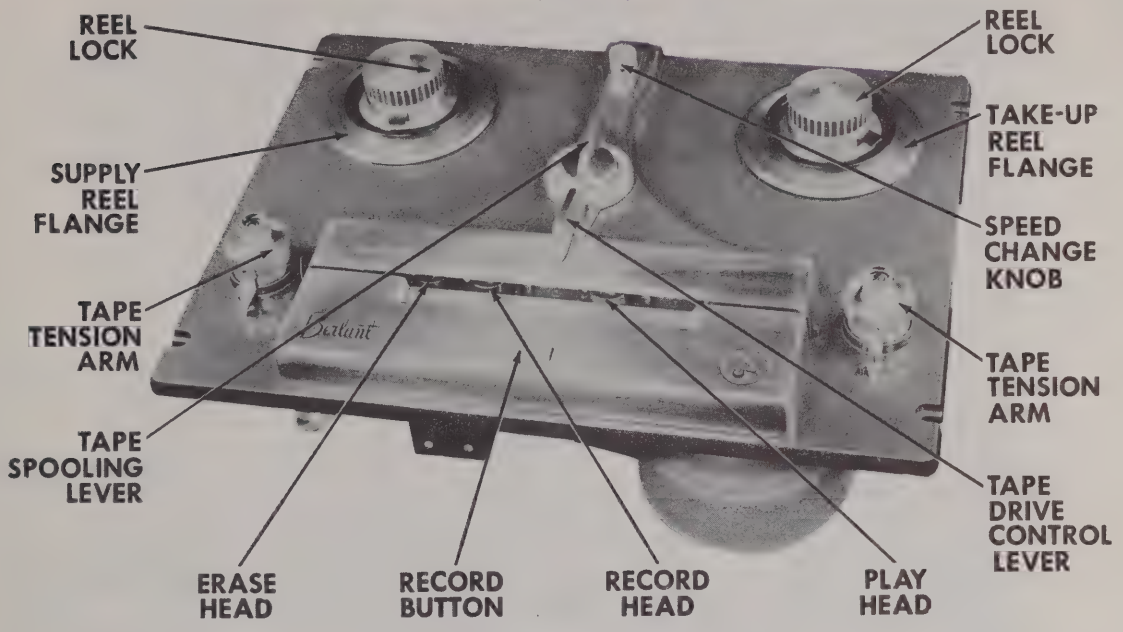


Figure 1

GENERAL INFORMATION

The Berlant Broadcast Recorder, Model BR-1, consists of two sections: the Broadcast Recorder Drive Mechanism, BD-1, and the Broadcast Recorder Amplifier, BA-1.

The drive mechanism is assembled on a ribbed aluminum plate which is designed for mounting on a standard relay rack, consolette or console, or into a portable carrying case. It may be operated in any position, from vertical to horizontal. All mechanical and electrical functions necessary to the function of the tape drive are self-contained.

The amplifier contains all the elements necessary to supply the erase and record heads of the mechanism with power, and to amplify the signal from the playback head to meet the requirements of a 600-ohm zero level distribution line.

The drive mechanism accommodates all size reels up to and including the standard NARTB 10 1/2" professional reel. Instantaneous selection between 15 inches per second and 7.5 inches per second tape speed is provided, with automatic correction of equalization.

Manufactured by:

Berlant Associates
4917 West Jefferson Blvd.
Los Angeles 16, Calif.

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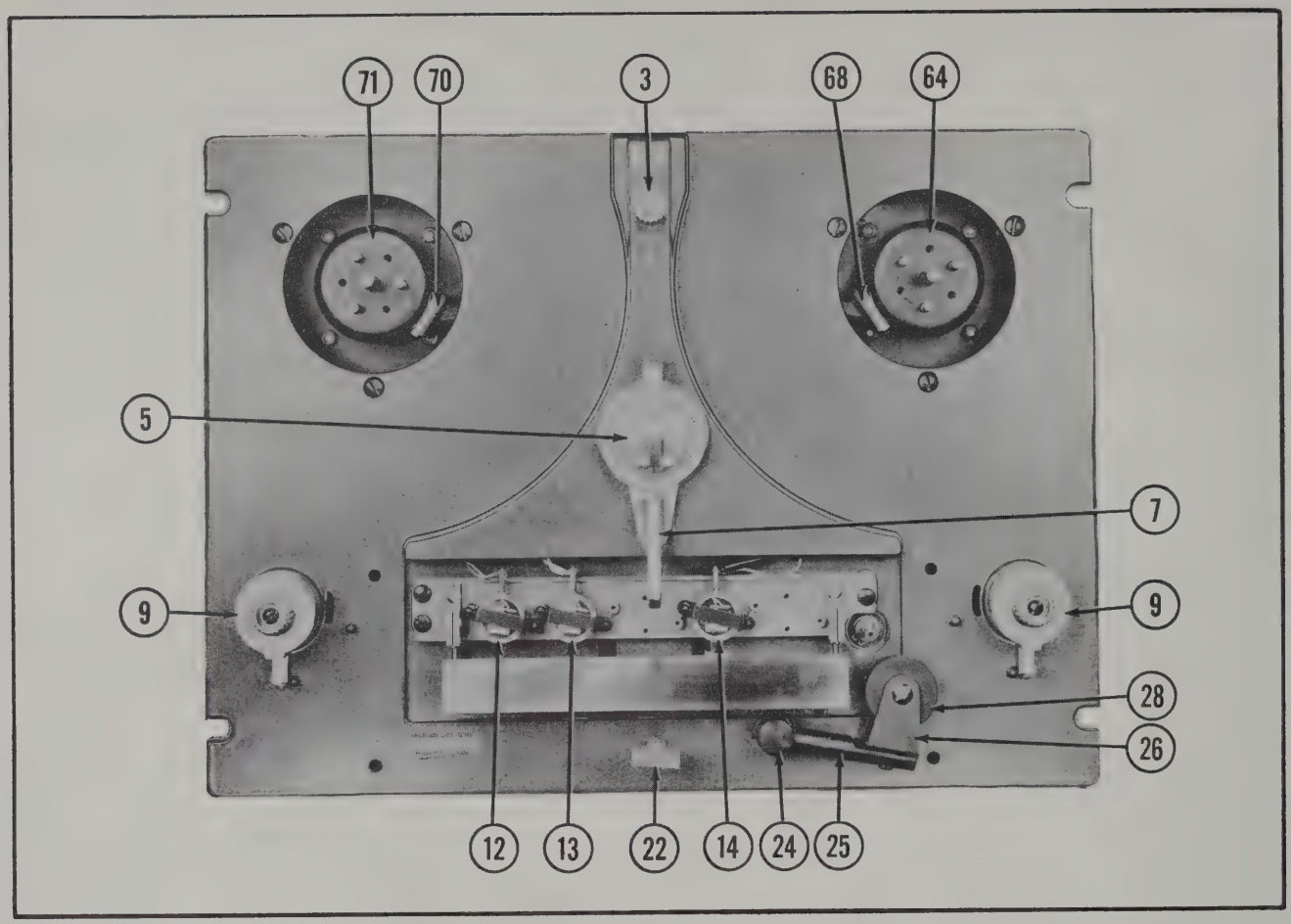

Figure 2

SPECIFICATIONS

Tape Speeds-

Instant selection of 15"/Sec. or 7.5"/Sec.

Frequency Response-

±2db from 40 to 15,000 cps. at 15"/Sec.
±2db from 40 to 10,000 cps. at 7.5"/Sec.

Signal To Noise Ratio-

55db as measured by proposed NARTB Standard (400 cps at 3% T.H.D.)

Total Harmonic Distortion-

2% at zero V.U.

Timing Accuracy-

Better than 99.8%

Total Flutter and Wow-

Less than 0.1% RMS at 15"/Sec.
Less than 0.2% RMS at 7 1/2"/Sec.

Rewind and Fast Forward-

Less than 60 secs. for 2500 feet.

From Stop to 15"/Sec. -

0.1 second.

Head Mounting-

Interchangeable bracket mounting up to five heads.

Meter Indication-

Bias current, record level, output level.

Monitor Output-

From tape or input signal.

Input Impedance-

One megohm on high impedance microphone input.
50/250 ohms balanced or unbalanced with plug-in transformer #T-3344. 200,000 ohms unbalanced bridging input.

Input Sensitivity-

55db on microphone input.
0.1 volt on bridging input.

Output Impedance-

Cathode follower. 600 ohms balanced output with plug-in transformer #T2560.

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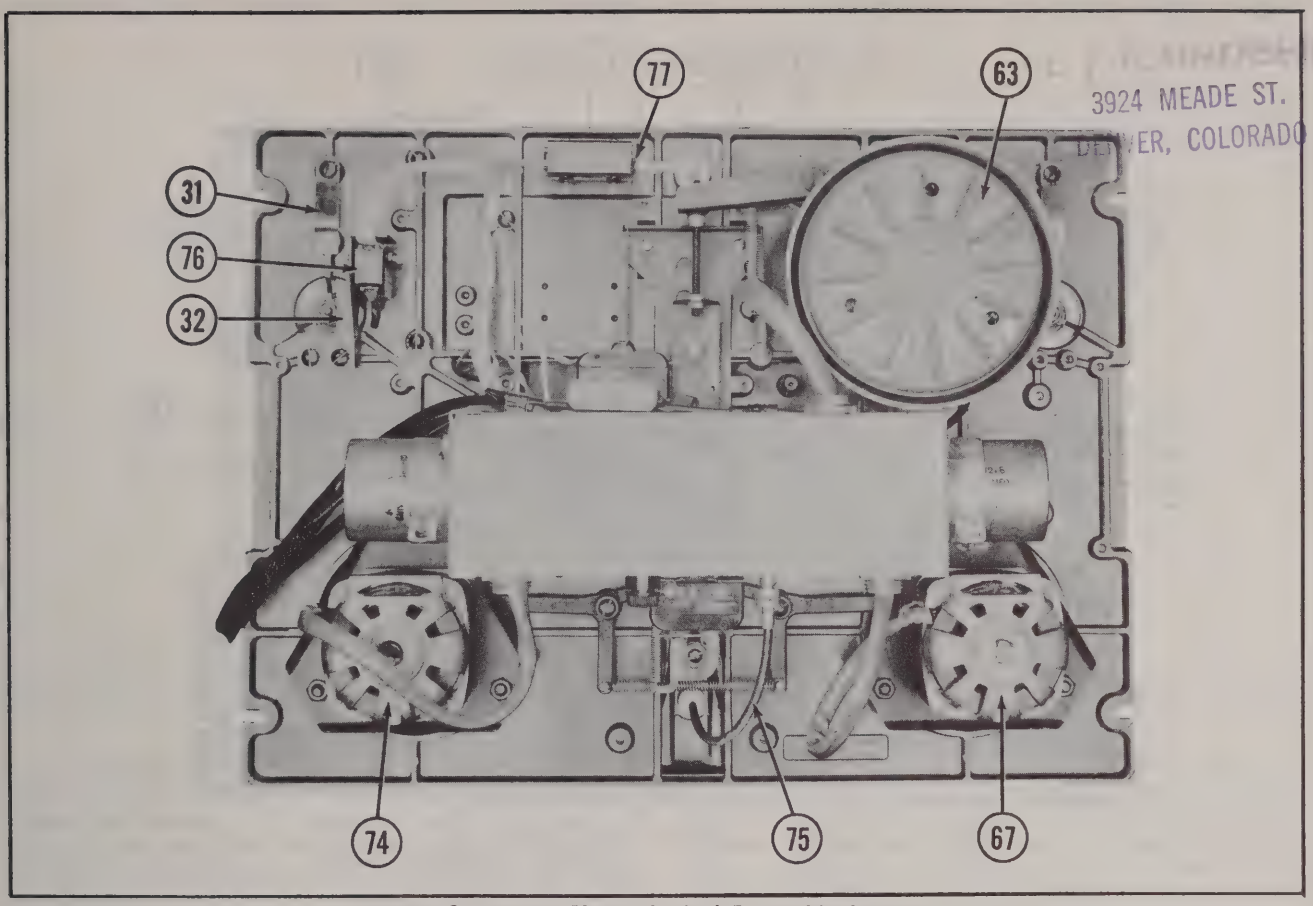

Figure 3. Bottom View of BD-1 Drive Mechanism.

Output Level-

2 volts from cathode follower output.
Zero DBM across 600 ohm line.

Filament Supply-

D.C. on all filaments.

Power Required-

115 volts, 60 cycles, 160 watts.

Functions Of The Drive Mechanism Controls

Tape Drive Control Lever: Normally pointing directly to the front of the panel which is the neutral or "Stop" position. This lever has three positions in addition to the neutral or "Stop" position. These are marked , "Run", "Cue", and "Edit".

Tape Spooling Lever: Normally points directly to the rear of the panel. This lever swings 120° each side of "Stop" to control speed and direction of fast-forward and rewind spooling of tape reels.

NOTE: The "Tape Drive Control Lever" is interlocked with the "Tape Spooling Lever", and actuating either lever automatically locks the other.

Speed Change Knob: This knob is located at the back center of the panel and controls speed and equalization of the tape when the mechanism is in "Run" position .

Record Button: This rectangular button located at the front center of the panel controls the "Record" and automatic erase function. This control is interlocked with the "Run" position of the "Tape Drive Control Lever".

Tape Tension Arms: These are located at the right and left of the tape loading slot. They lock out of position while tape is being loaded. When engaged, they equalize tape motion and stop the recorder in the event of tape failure or at end of reel.

Functions Of The Amplifier Controls

Record Knob: The "Record" knob regulates the signal being applied to the tape during the record process. The knob is calibrated in 10 steps from 0 to 10, with maximum gain at 10.

Output Knob: From 0 at the center position, the "Output" knob is calibrated in five steps to 10 on each side . The scale to the left of center is marked "Source", and indicates the output amplifier gain directly from the incoming signal. The scale to the right of center is marked "Tape", and indicates the output from the tape .

Meter Knob: The "Meter" knob switches between three positions: "Bias", "Record", and "Output," to measure the output of each on the meter.

On-Off Switch: The "On-Off" switch controls the 115-volt supply to both amplifier and drive mechanism. The illumination of the meter face indicates when the recorder is switched "On".

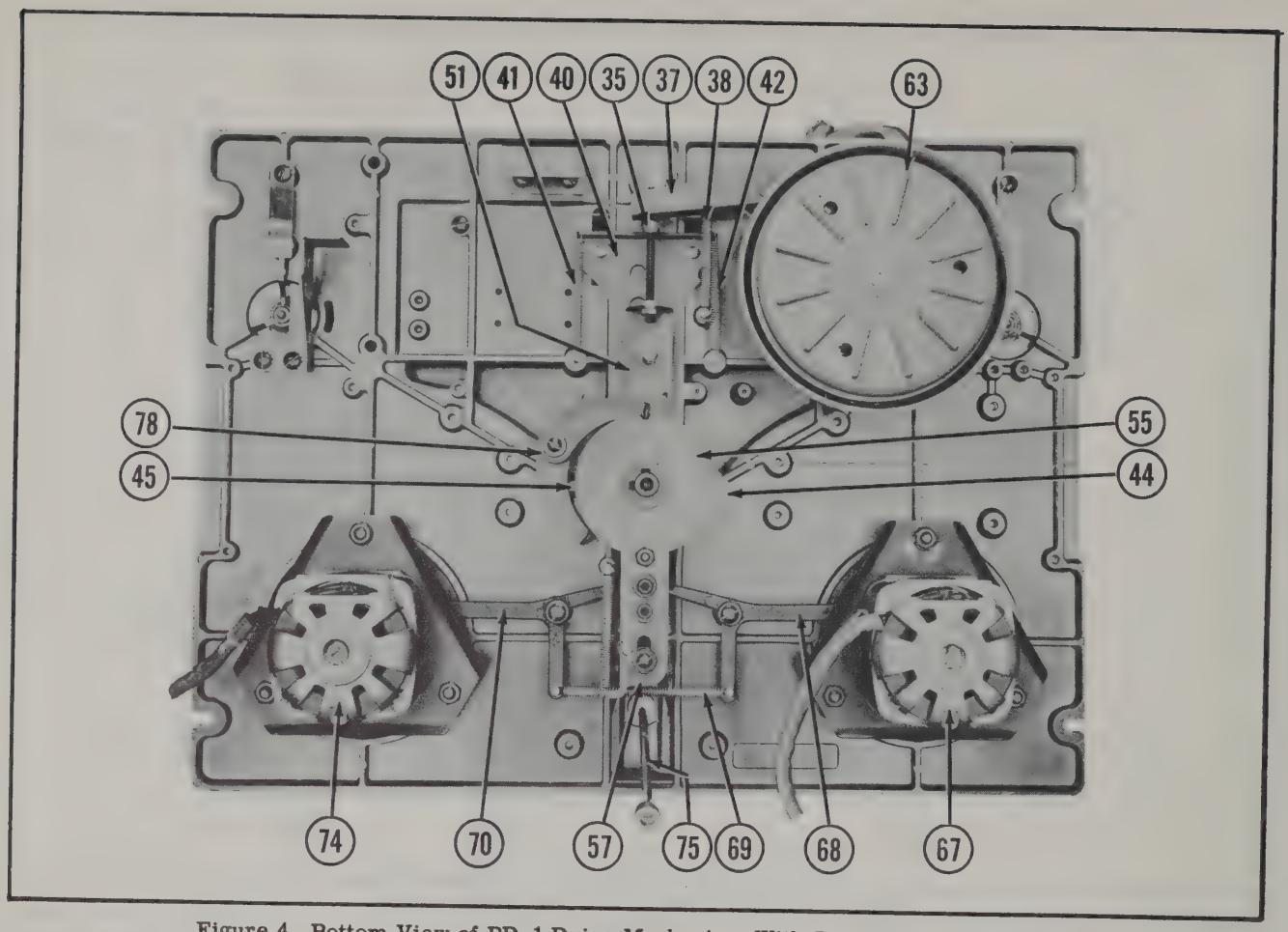

Figure 4. Bottom View of BD-1 Drive Mechanism With Junction Box Removed.

OPERATING INSTRUCTIONS

Tape Loading Procedure-

The Berlant Concertone Reelok serves as a lock for RMA type hubs, and as a combination centering device and lock for NAB hubs. To lock either reel in place, center the Reelok over the spindle and drive pins of the reel flange (2). See that the flange fits snugly on the reel. Push in the center button of the Reelok as far as it will go. To unlock the reel, press the release lever on the side of the Reelok.

Set tape drive control (7) and tape spooling lever (5) to "Stop". Load a full reel of tape on the left-hand reel flange (2). Place an empty reel on the right-hand reel flange. Turn the left-hand tape tension knob (9) counterclockwise, and the right-hand tension knob clockwise until the tension arms lock on the detents. Draw the free end of the tape around the supply roller (9B), through the head slot, and around the take-up roller. Fasten the end of the tape to the take-up reel.

Turn the take-up reel once or twice to fasten tape securely. Release tension arms to engage tape.

To Make A Recording-

With tape in place, the tape control levers set at "Stop", and the power switch "On", turn speed control knob (3) to the desired tape speed.

Hold down record button (22) while moving the tape drive control (7) to "Run" position. Turn the Meter control to "Record". Set the Record gain knob to a point where the maximum signal peaks do not exceed 100 on the meter scale.

To Monitor The Recording-

Turn the Output level knob to the left to monitor the incoming signal; to the right to hear the signal being played back from the tape. This A-B comparison may be made without affecting the recording. The meter may also be switched to read "Output" level after proper "Record" level has been set.

When Recording Is Finished-

Place the tape drive control (7) in the "Stop" position. The record button (22) will be released automatically, making accidental erasure impossible.

To Play Back A Recording-

Move tape drive control (7) to the "Run" position. Turn the Meter selector knob to "Output". Turn the Output level control to the right (Tape), until the desired level is obtained. To end the playback, return tape drive control (7) to the "Stop" position.

Fast forward or fast rewind of the tape is controlled by the tape spooling lever (5). In this mode the tape is close enough to the heads to be heard. The speed of the tape may be governed by the rotation of tape spooling lever (5) and the approximate location of the desired spot found. This done, return the spooling lever to its "Stop" position.

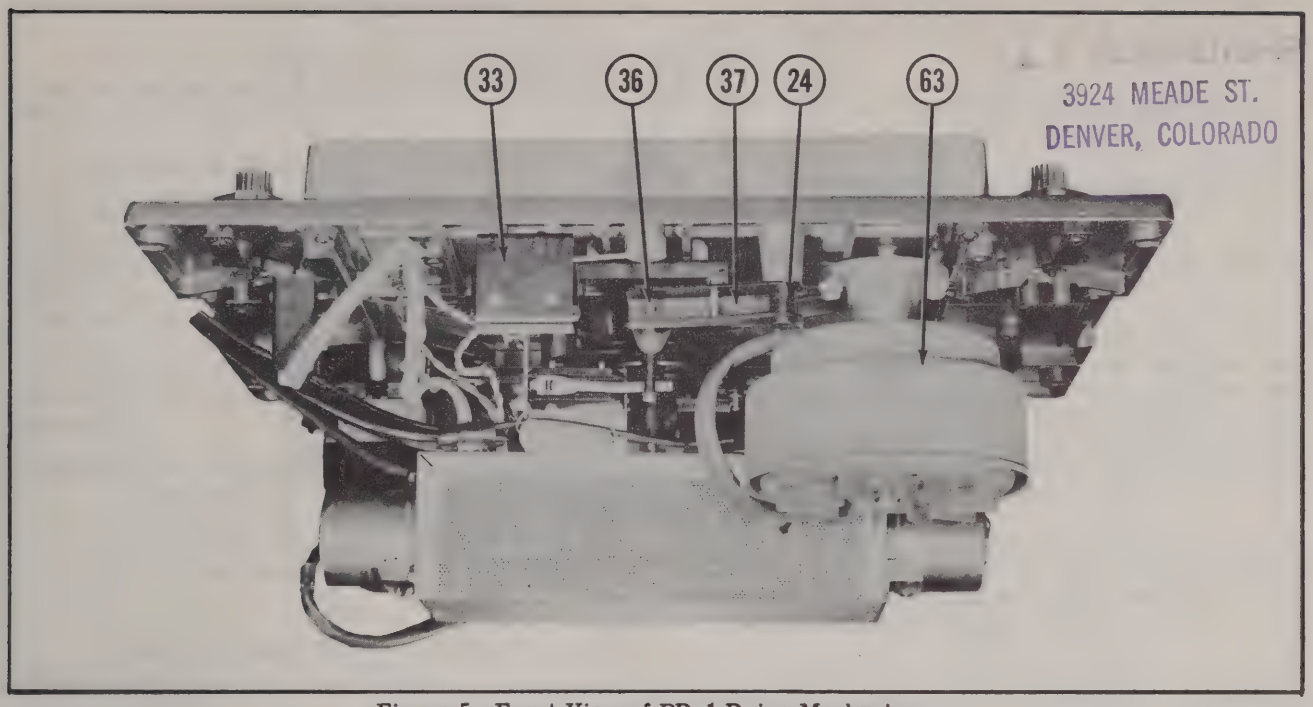

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Figure 5. Front View of BD-1 Drive Mechanism.

Moving the tape drive control (7) to the left to "Cue" position wraps the tape around the heads, releases the brakes, and leaves the reels under motor tension. The reels may now be moved in either direction by hand while listening. Thus it is possible to locate an exact point on the tape for accurate cuing or editing .

If an exact Cue spot is desired, the tape drive control lever is now returned to "Stop" until the tape is to be played. Then the lever is turned to "Run" .

When an exact Editing spot is located the tape drive lever is moving from "Cue" to "Edit" position. This applies the brakes and opens the head closure fully. The tape may now be marked with a grease pencil directly over the gap in the playback head (14), or scissors may be inserted, moved into position at the playback gap, and the tape cut accurately.

MECHANICAL MAINTENANCE

Cleaning The Heads-

The heads are subject to an accumulation of tape coating oxide which is worn off the tape as it passes these parts. In many recording studios the heads are cleaned before every recording is made or played back, but under average conditions cleaning heads each ten hours of use will give excellent results.

Before loading the tape, move tape drive control (7) to "Edit". Dampen a clean piece of fabric, such as fine muslin, with alcohol and carefully wipe the pole pieces of the heads with the muslin wrapped across the ball of the index finger. It is not necessary to saturate the cloth. A small amount of alcohol is enough.

Occasional attention also should be paid to the shaft of the capstan drive motor (63) and pressure roller (28). Remove the lower head cover (11) by grasping each end and pulling away from the baseplate. This casting , as well as the upper head cover (10), is located by two dowel pins anchored into the baseplate. The covers are held in place by friction springs located inside the castings. With the cover removed, clean the capstan motor shaft (63) and pressure roller (28) in the same manner as the heads. Replace lower head cover (11) by locating it on the two dowel pins and pushing it back in place. Make sure record button (22) is properly aligned to fit the opening in lower head cover (11) .

Although slow decay characteristics are built into the circuitry to prevent magnetization of the heads , with resultant noise (hissing and crackling) and loss of high frequency response, it is wise to demagnetize the heads at the same time they are cleaned. Head demagnetizers are supplied by various manufacturers at reasonable prices. They should be used in accordance with instructions. Always be sure the recorder is switched off when the demagnetizer is used.

Head Alignment Procedure-

If frequency response on the recorder becomes deficient, and it is not due to dirt on the heads, worn heads, or excessively high bias adjustment, misalignment of the heads may be the cause.

To realign the heads, first remove the head cover castings. Then clean and demagnetize heads, capstan and pressure roller. Load the recorder with a standard alignment tape. Turn the meter switch to "Output" and the Output Control Knob to a point on the "Tape" scale giving a meter reading of 100 from the 12KC signal .

Slowly turn the adjustment screw (15) on the playback head (14). If the meter reading goes down , turn screw (15) in the other direction. If the meter reading does not go beyond the 100 point during this process, the head does not need adjusting.

There are two methods that may be used to adjust the record head, they are as follows:

A. Turn the output gain down to 0 and transfer the playback head leads to record head (13). This head

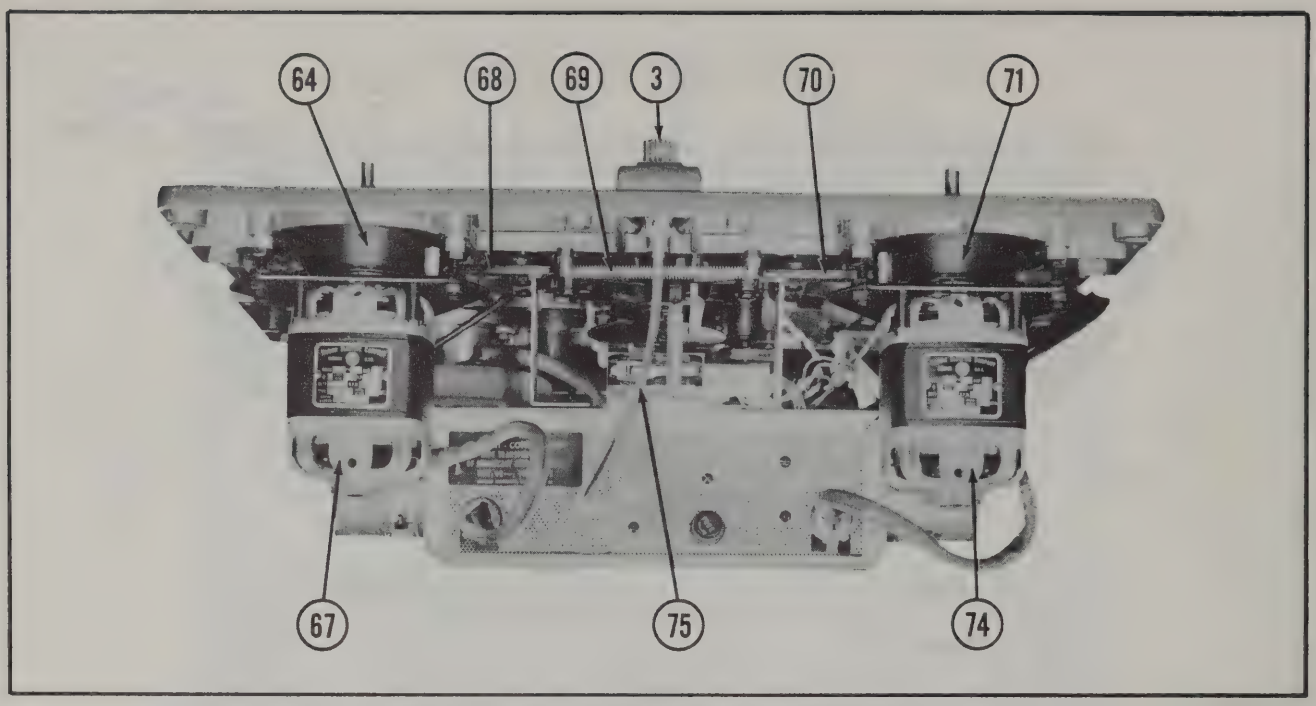

Figure 6. Rear View of BD-1 Drive Mechanism.

will now function as a playback head during the adjustment. Repeat the above test procedure for the record head. After adjustment is completed, return the head leads to their original positions.

B. When using this method to adjust the record head (13), replace the standard adjustment tape with a reel of blank tape. Operate recorder in "Record" position while feeding in a 12KC signal from a signal generator, at a level of minus 20DB. Set playback level to read 100 on the meter, and adjust record head (13) as the playback head (14) was adjusted.

NOTE: Remember, there is a time lag of a fraction of a second while the tape is moving from the record to the playback head.

Adjust the record head until the maximum response is obtained from the playback.

Pressure Roller Adjustment-

There are two adjustments on the pressure roller mount and arm. These may need resetting after replacing a pressure roller, or to compensate for wear on it.

If the pressure roller has been replaced, the first adjustment to be made is to parallel the face of the roller to the drive capstan. Loosen the cap screw on the end of arm (25) and align pressure roller (28) until it is vertically parallel to the capstan. Tighten the cap screw until it is solidly seated.

Next loosen the lock screw at the center of the roller mounting bracket (26) and adjust for lateral displacement. The center of pressure roller (28) should be about 1/7" to the right of a line through the center of the capstan. The bracket (26) must be adjusted by rotating it around the lock screw as an axis until the pressure roller will run in contact with the capstan with no skew action. Tighten set screw until it is seated solidly.

The third adjustment must be made when a pressure roller is replaced or to compensate for wear. This is the pressure roller adjustment nut (35). With the recorder in operation, loosen nut (35) until the pressure roller does not drive the tape. Then turn in the opposite direction until pressure roller engagement is positive, and flutter and wow are at a minimum. Do not exert more than the minimum amount of pressure necessary to achieve this effect or undue wear on the capstan and motor bearings may result.

Tape Tension Arm (9) Adjustment-

The tape tension arms (9) have a dual function; they serve to eliminate tape slack while absorbing small reel irregularities, and to turn off the recorder mechanism if the tape is broken or exhausted.

If the tension is too great, the cut-off switch (76) will be actuated unnecessarily. If the tension is not great enough, the cut-off switch will not actuate.

To readjust the tension, loosen the lock nut on the screw protruding below the baseplate. Turn the screw in the direction of spring actuation to increase tension, or in the opposite direction to decrease tensions. Tighten the nut below the baseplate to lock the adjustment.

Brake Adjustment-

There is only one adjustment on the brake assembly. This is a single bracket fastened to brake slide (57) by two lock screws.

To Adjust: With the recorder off, place the tape control lever (7) in the "Run" position. Loosen the two brake adjustment screws on brake slide (57) and move the brake adjustment bracket back until the brake arms (68 and 70) are lifted clear of the brake drums by 1/16 inch. Tighten the brake adjust lock screws until firmly seated. Return tape drive control (7) to "Stop", and turn spooling lever (5) to each side. As the brake drums revolve, check to insure clearance of brake arm pads from drums.

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LUBRICATION

Normal maintenance lubrication is required only on the two spooling motors (67 and 74) and on the capstan drive motor (63).

Lubricate motors (67 and 74) as follows:

Place 15 drops of Gulfcrest "A" or Standard "C" oil in both oil holes on each motor after 500 hours of operation or at three month intervals. After operating the recorder, remove any excess oil that is forced out of the bearings by the initial run.

Following is the procedure to remove the rotor shaft and to lubricate the bearings of the capstan drive motor (63):

CAUTION: The capstan drive motor (63) should be disassembled only by persons thoroughly familiar with precision assemblies, and under conditions of extreme cleanliness. Dirt introduced into the bearings can ruin them.

1. Remove the "Snap-Ring" adjacent to the capstan with a screw driver or a pair of pliers.

2. Remove the thrust washer behind the "Snap-Ring".

3. Pull out the rotor shaft by holding the die cast rotor in the rear of the motor.

4. The motor is now ready for lubrication.

5. Add one drop of oil to the bore and one drop of oil to the flange of the two bearings in the motor mount. The oil should be Shell Oil Tellus No. 23; Standard Oil Calol Turbine No. 9 or General Petroleum Gargoyle DTE light, or a high grade of light machine oil S. A. E. No. 10 or lighter.

6. Reassemble the motor by reversing the above procedure. Be sure that the two thrust washers (one at each bearing) are not left out.

If bearings or shaft are excessively worn, it is recommended that they be returned to the factory for replacement. If the work is done by others, bearings must be diamond-bored and shaft-ground to five micro-inch finish for satisfactory results. Under no circumstances attempt to scrape bearings or repolish shaft. This will always result in inferior performance.

AMPLIFIER MAINTENANCE PROCEDURES

Bias Level Adjustment-

Recorded signal level, distortion, and frequency response are all affected by bias level. The bias level is set at the factory to give optimum results on red oxide, plastic base tape. The meter reading at "Bias" position has been adjusted to read 100 for this bias setting. Aging of components and other factors may cause the bias level to change.

Procedure for resetting bias level to restore optimum performance, or to obtain the best results from a specific brand or type of tape is as follows:

1. With the recorder off, zero the meter by the screw adjustment on the front.

2. Turn the record amplifier on and run for at least 10 minutes, until all electronic components are hot.

3. Feed a 1000-cycle note into the recorder, setting a record level of 80 on the meter.

4. Switch the meter to "Output". Set output level to 100.

5. Turn bias adjust control on amplifier chassis counter-clockwise, decreasing bias.

6. Slowly return bias adjustment control clockwise, as you watch the output meter. Increase bias slowly, until meter reaches maximum reading, and begins to fall. Continue increasing bias until meter indicates decrease of 1 1/2 to 2DB in output of tape. Remember there is a time delay of 1/10 second between the record and playback functions.

This represents the optimum setting for general recording purposes. The reason for going past maximum response is to establish a safety margin for variation in tapes and operating conditions.

Reducing the bias below optimum increases high frequency response and also distortion. Increasing the bias beyond this point decreases high frequency response and distortion.

Bias Meter Adjustment-

Following the bias level adjustment, the meter reading should be checked, and if necessary, reset to give a reference reading of 100 for purposes of checking bias level from time to time.

The meter reading may be reset to 100 by the screwdriver adjustment on the chassis, marked "Bias Meter Adjust".

Frequency Response Check-

Equipment required is an audio oscillator known to have a good signal to noise ratio and stable output from 20 to 20,000 cycles. This should be connected to the bridging input of the BA-1 amplifier with low loss shielded lead. (A resistor load of 1000 ohms should be placed across the output of the recorder).

The first step is the determination of correction factors for the oscillators and connections.

1. Set meter to "Output".

2. Feed a 1000-cycle note into the amplifier.

3. Set the output control knob to a point on the "Source" scale giving a meter reading of 100.

4. Set the oscillator for 50 cycles, noting ±DB deviation from 1000 cycles. Using the decade switch on the oscillator, note deviation for 500 and 5000 cycles.

5. Set oscillator for 100 cycles and use decade switch to obtain deviations for 1000 and 10,000 cycles.

6. Repeat procedure for 150 cycles, 1500 and 15,000 cycles.

7. Start recorder in "Record" position.

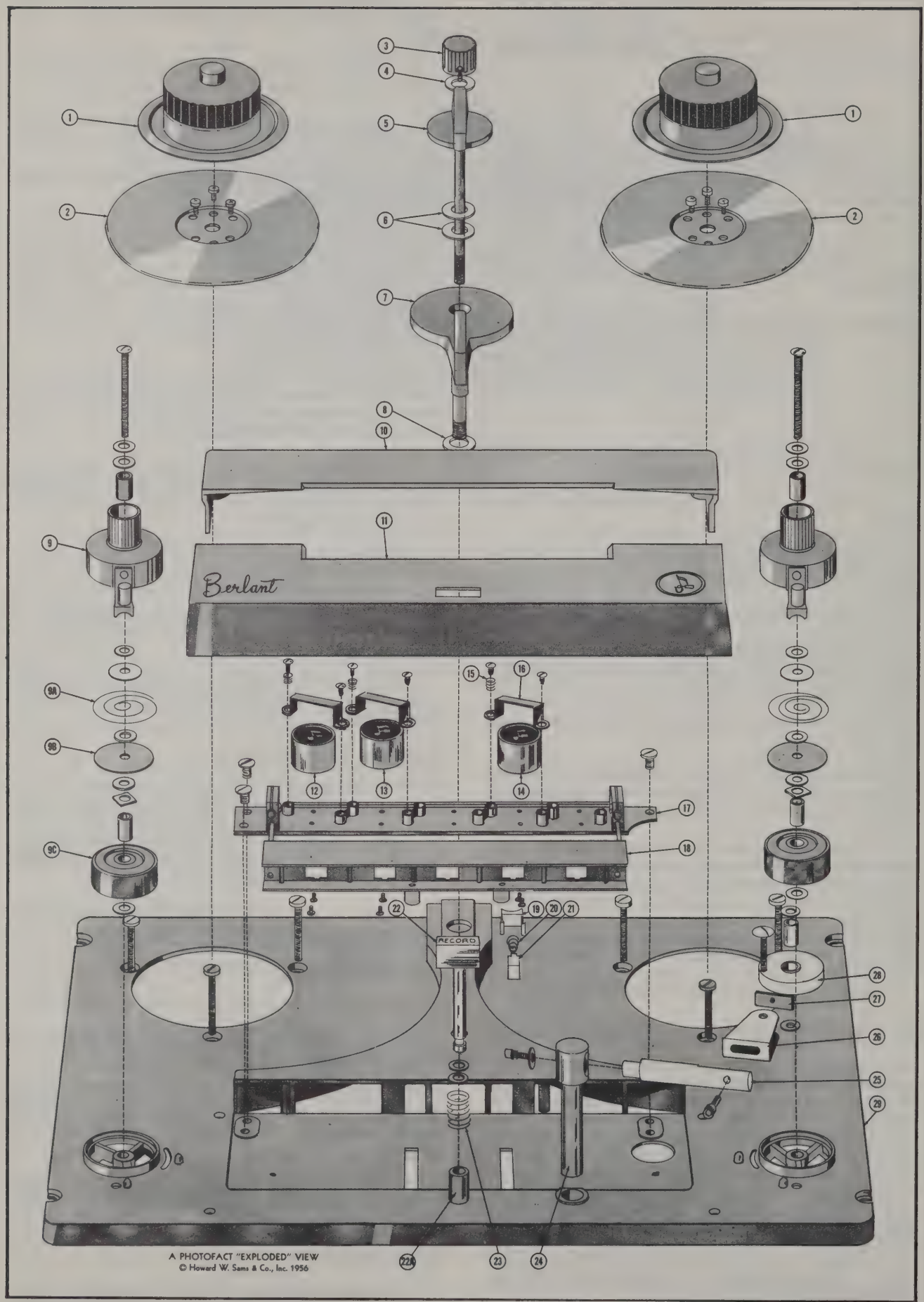


Figure 7A. Exploded View of Parts Above Baseplate.

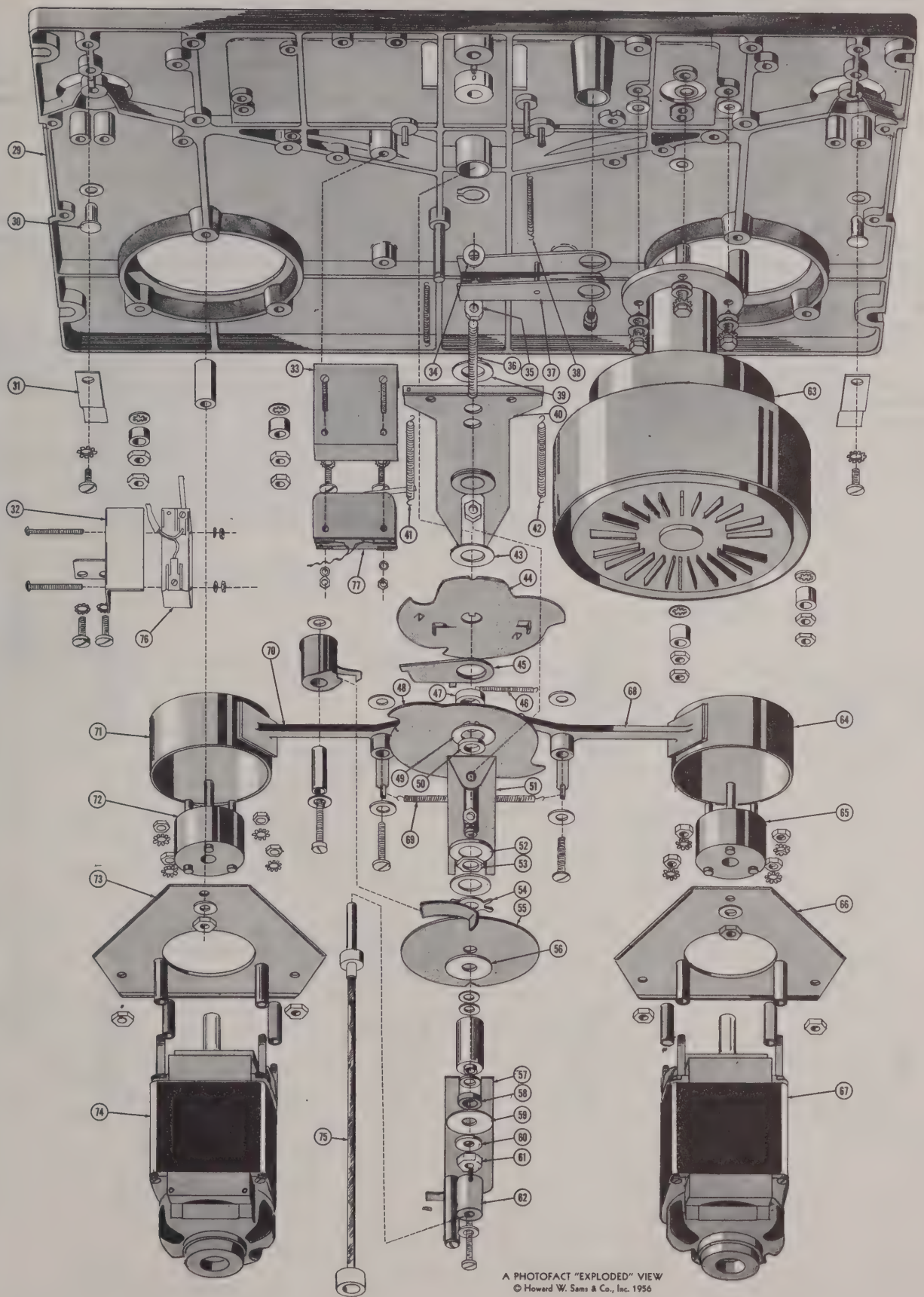


Figure 7B. Exploded View of Parts Below Baseplate.

8. With the meter on "Record", set "Record" knob to give meter reading of minus 20 at 1000 cycles . Do not move this control for balance of test. Record 30 seconds at this level.

9. Set oscillator at 50 cycles, use decade switch to switch to 500 and 5,000 cycles, recording about 30 seconds at each frequency.

10. Repeat for 100,1000 and 10,000 cycles, and for 150, 1500 and 15,000 cycles.

11. Rewind tape to starting point of test. Set meter on "Output", and play back the tape. Set "Output" knob on "Tape" scale to give meter reading of 100.

12. Note readings for each frequency recorded in #9 and #10. Apply correction factors noted in #4 , #5, and #6. The result is the deviation in frequency response of the recorder in making and playing back a recording.

INPUT AND OUTPUT CONNECTIONS

Two inputs are provided on the rear of the BA-1 amplifier. The microphone input is a 3-wire jack connected to an octal socket designed to permit adaption to a wide variety of inputs by plug-in transformers and other accessories. With the socket strapped for continuity, the input is for a high impedance (1 megohm) microphone.

For 50/250 ohm balanced and unbalanced microphones and other low level sources, refer to connection diagrams shown in Figure 8.

The 200,000 ohm bridging input is designed for connection to standard high impedance, phono level lines, or to bridge unbalanced studio lines, or to bridge from one side to ground of balanced lines.

The output connection is by a 3-contact jack coupled to the output tube through an octal socket and accommodating a plug-in transformer to convert the output from a cathode follower giving a 2 volt signal to a 600 ohm balanced line zero DBM signal.

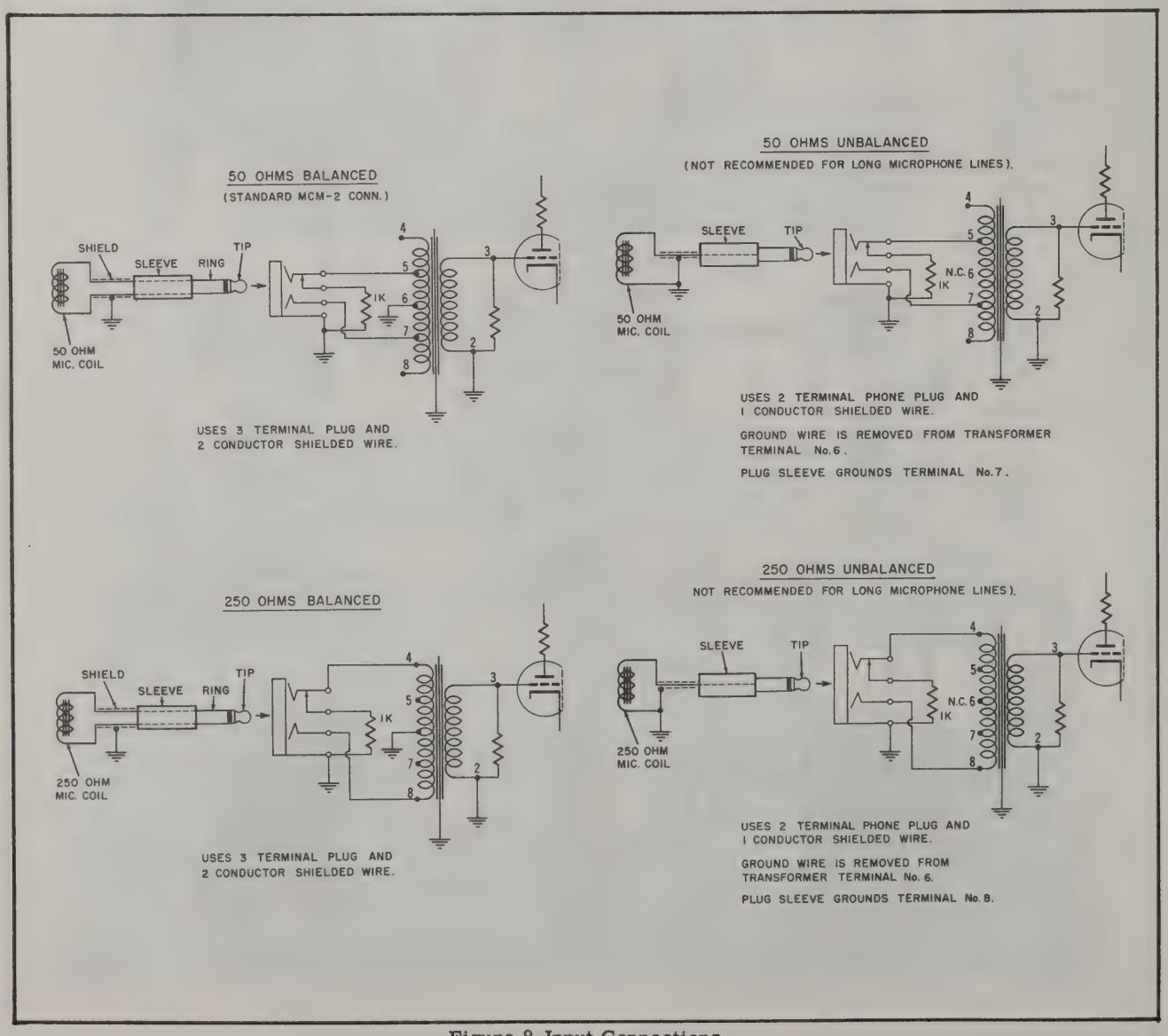


Figure 8. Input Connections

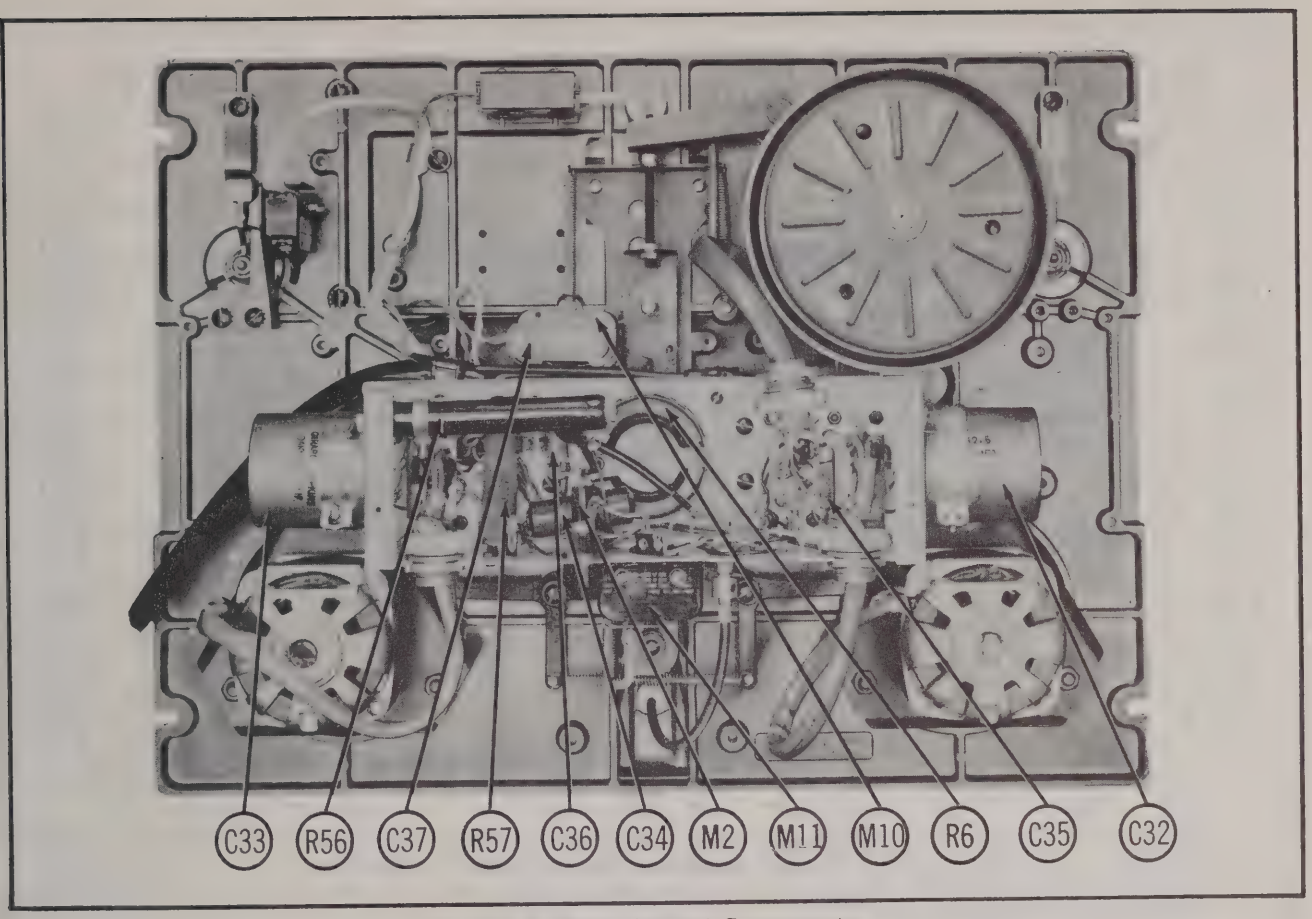
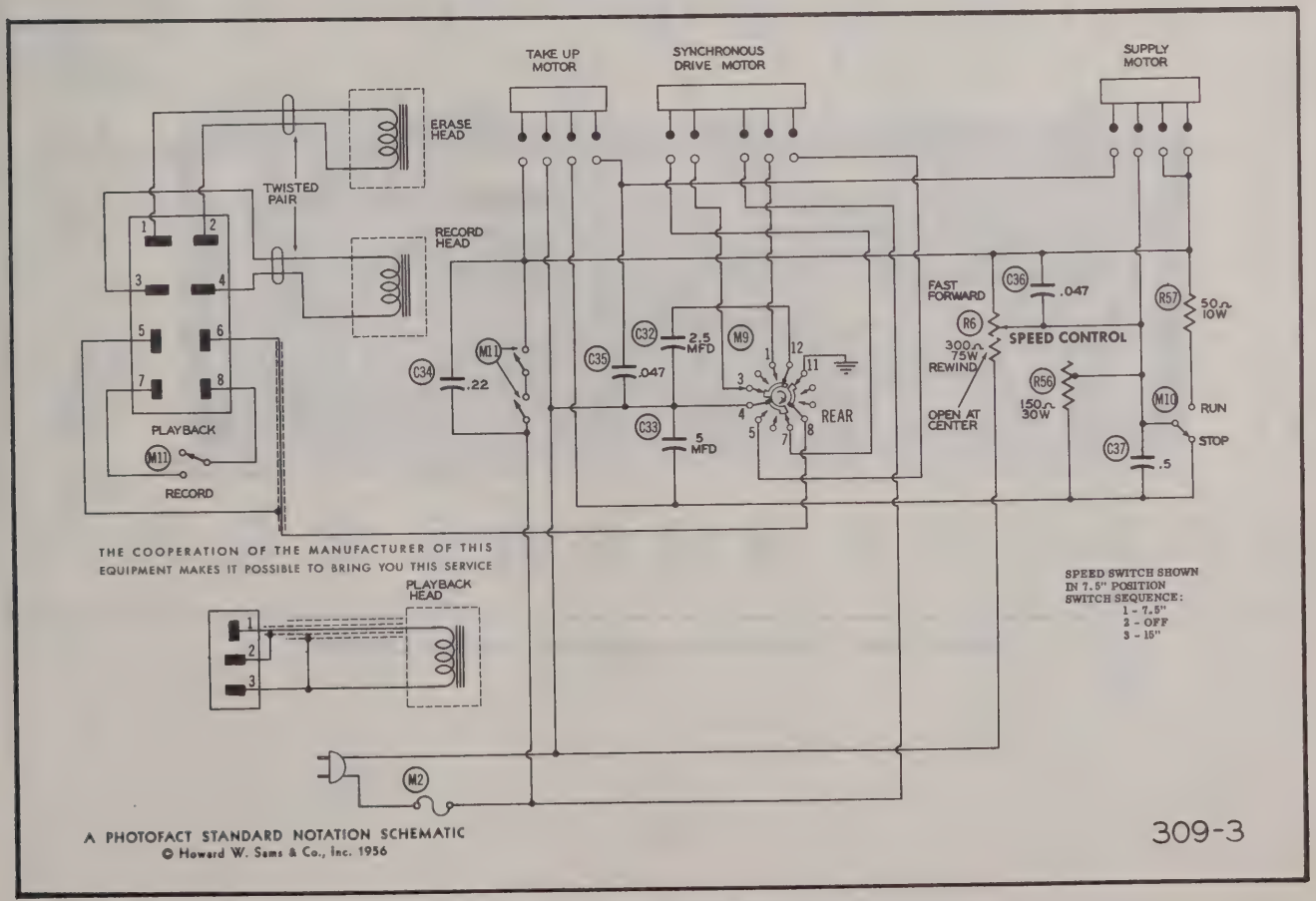
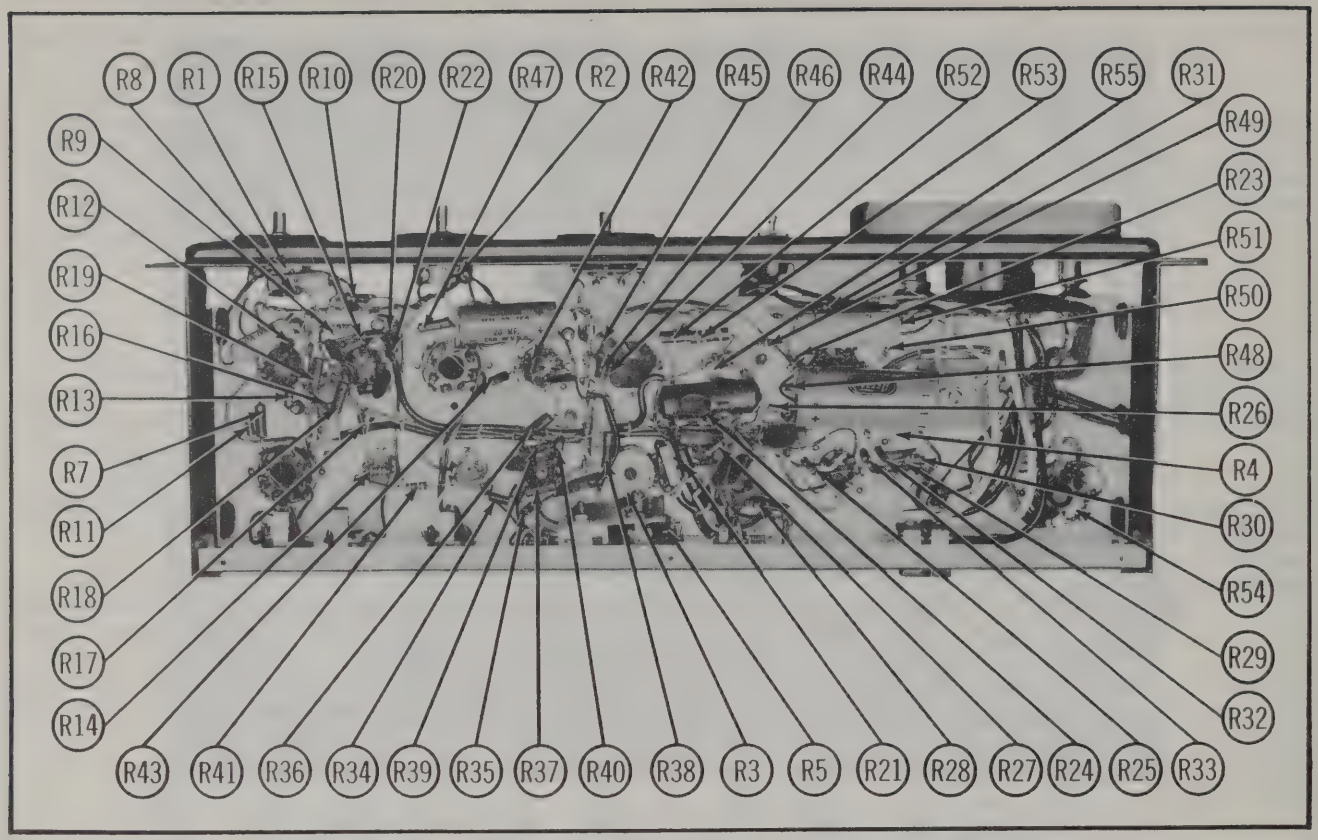


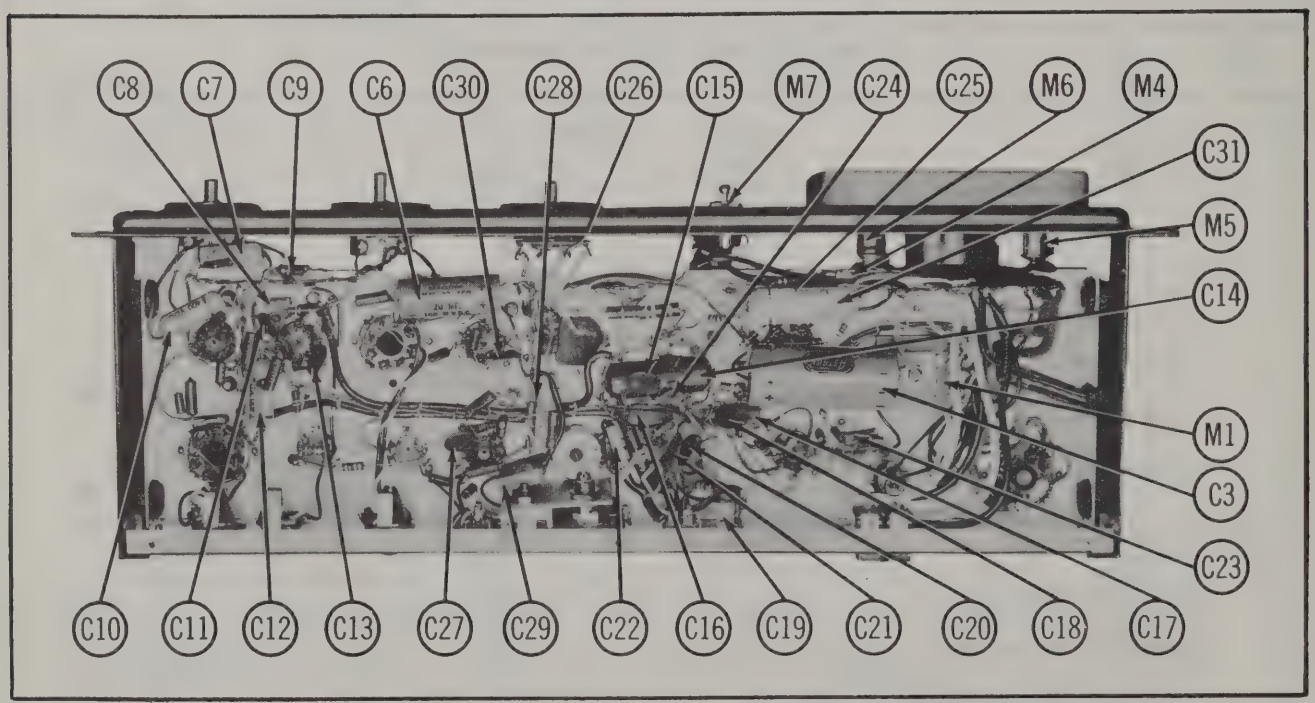
Figure 9. Motor Control Components.



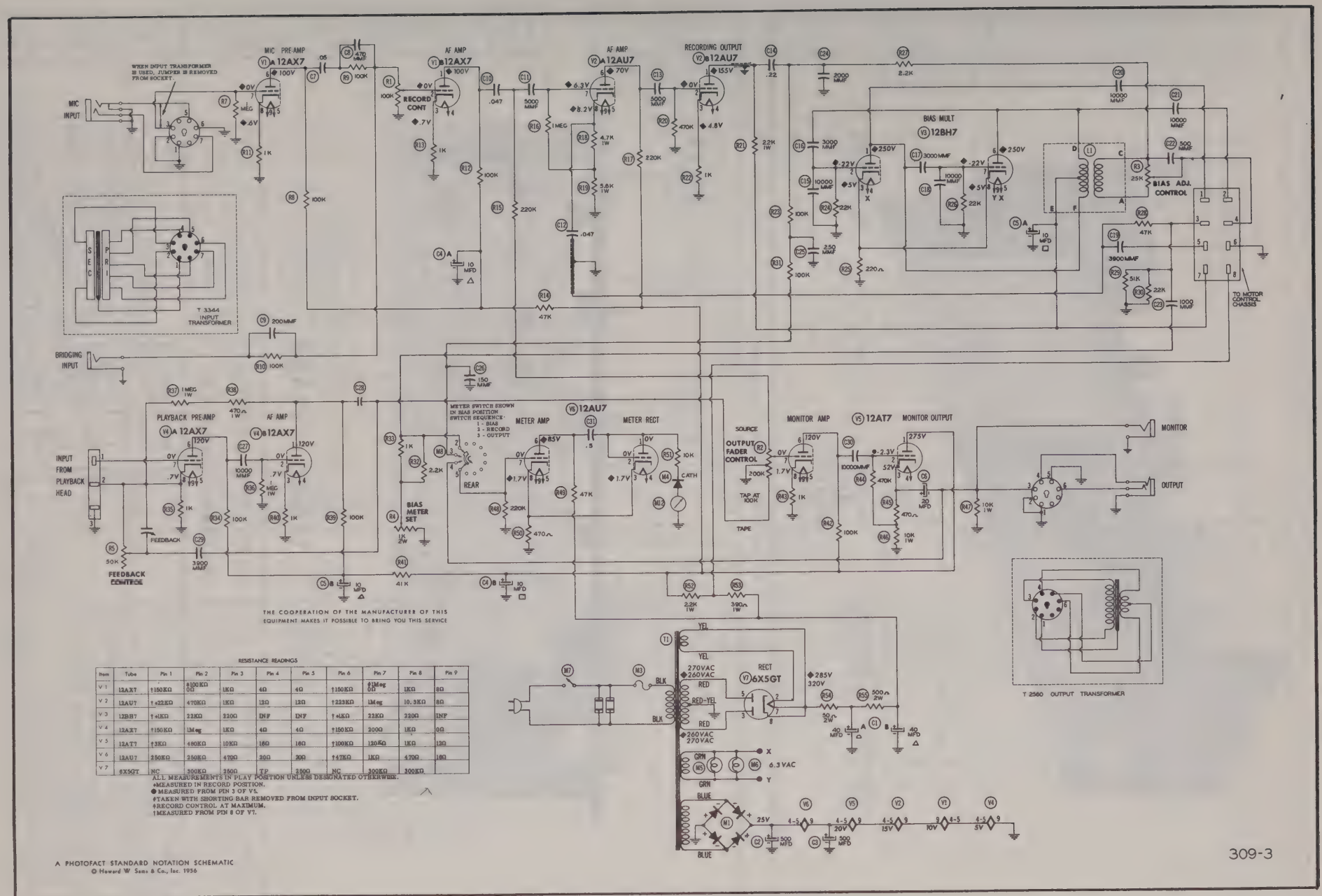
Motor Control Schematic



Bottom View Of BA-1 Amplifier Showing Resistor Locations.



Bottom View Of BA-1 Amplifier Showing Capacitor Locations.



THE COOPERATION OF THE MANUFACTURER OF THIS EQUIPMENT MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	12AX7	†150KΩ	◆100KΩ 0Ω	1KΩ	4Ω	4Ω	†150KΩ	◆1Meg 0Ω	1KΩ	8Ω
V 2	12AU7	†+22KΩ	470KΩ	1KΩ	13Ω	12Ω	†223KΩ	1Meg	10.5KΩ	8Ω
V 3	12BH7	†+1KΩ	22KΩ	220Ω	INF	INF	†+1KΩ	22KΩ	220Ω	INF
V 4	12AX7	†150KΩ	1Meg	1KΩ	4Ω	4Ω	†150KΩ	200Ω	1KΩ	0Ω
V 5	12AT7	†3KΩ	480KΩ	10KΩ	18Ω	18Ω	†100KΩ	120KΩ	1KΩ	13Ω
V 6	12AU7	250KΩ	250KΩ	470Ω	20Ω	20Ω	†47KΩ	1KΩ	470Ω	18Ω
V 7	6X5GT	NC	300KΩ	250Ω	TP	250Ω	NC	300KΩ	300KΩ	

ALL MEASUREMENTS IN PLAY POSITION UNLESS DESIGNATED OTHERWISE.
◆MEASURED IN RECORD POSITION.
● MEASURED FROM PIN 3 OF V5.
◊TAKEN WITH SHORTING BAR REMOVED FROM INPUT SOCKET.
‡RECORD CONTROL AT MAXIMUM.
†MEASURED FROM PIN 8 OF V7.

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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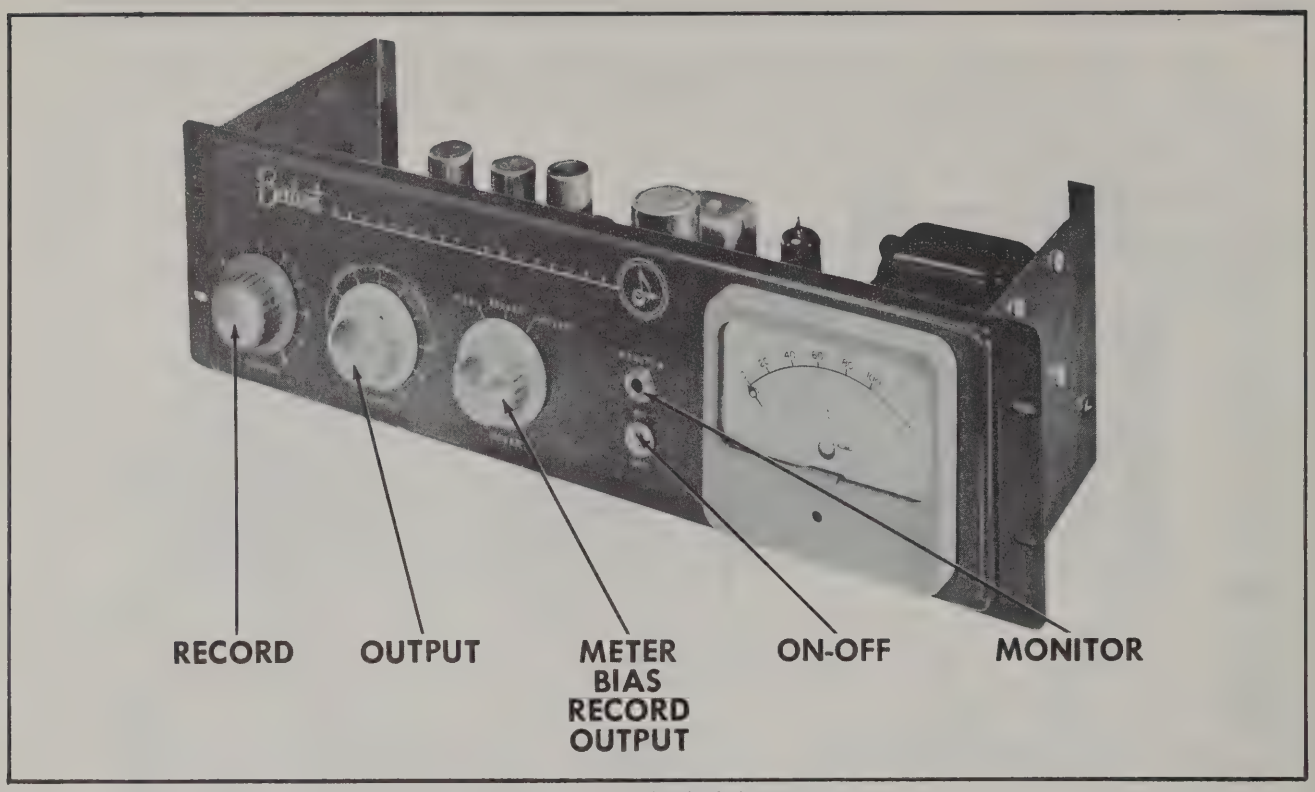
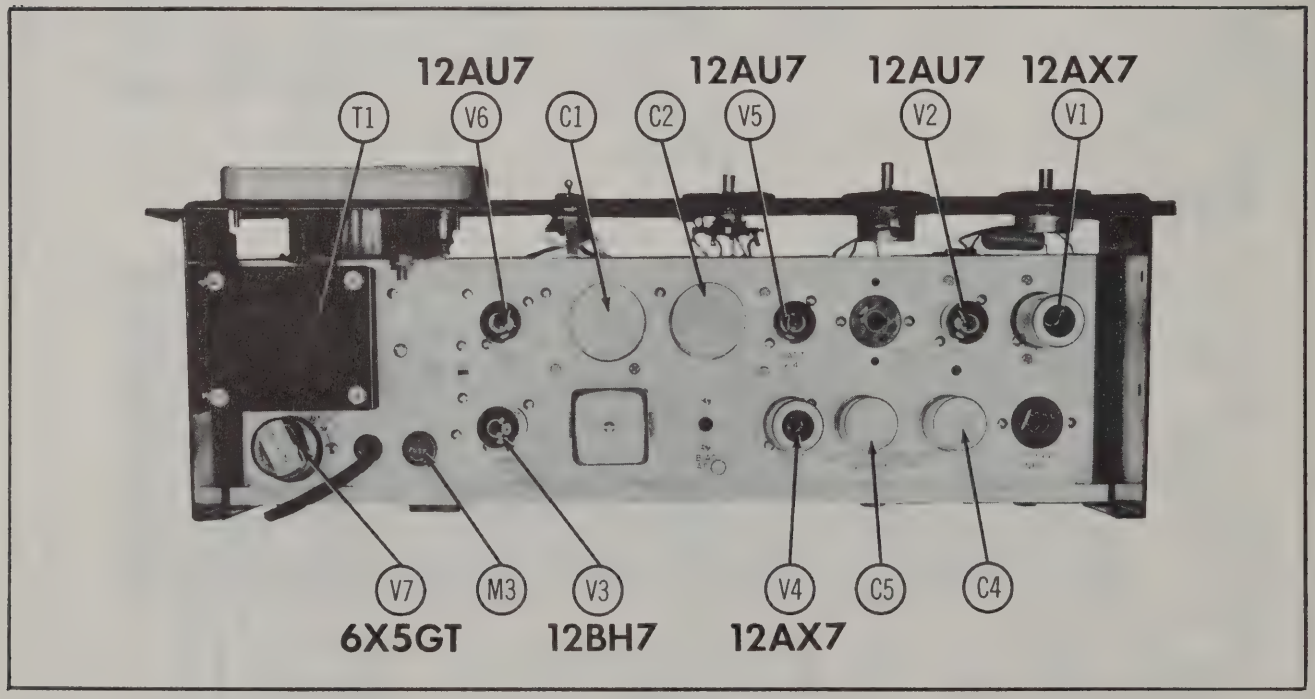
309-3

Schematic, BA-1 Amplifier.

BERLANT MODEL BR-1



Front View Of BA-1 Amplifier



Top View Of BA-1 Amplifier

MECHANICAL PARTS LIST

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
1	21120	Reel Lock Assembly	7	21003	Tape Drive Control Lever
2	21137	Reel Flange	8	1039	Flat Washer
3	21141	Speed Change Knob	9	21099	Tape Tension Arm Assembly
4		Flat Washer	9A	1095	Damper Spring
5	21006	Rewind Lever	9B	1096	Damper Spring Shield
6	1039	Flat Washer (1 or 2 as needed)	9C	1086	Tape Tension Roller Assembly

MECHANICAL PARTS LIST-Con't.

Ref. No.	Part No.	Description
10	21002	Upper Head Cover
11	21002	Lower Head Cover
12	BT-2	Erase Head
13	BT-4	Record Head
14	BT-6	Play Head
15	1105	Head Clamp Spring
16	1104	Head Clamp
17	1101	Head Mounting Bracket Assembly
18	21110	Tape Engage Assembly
19	1114	Head Shield
20	1113	Spring
21	1112	Spring Retainer
22	21080	Record Button Assembly
22A	1083	Record Shaft Sleeve
23	1085	Record Shaft Spring
24	1069	Pressure Arm Shaft
25	1068	Pressure Roller Arm
26	1062	Pressure Roller Mtg. Bracket
27	1067	Pressure Roller Nut Plate
28	1064	Pressure Roller Assembly
29		Baseplate
30		Tension Arm Lock Button
31		Lock Button Tension Spring
32		Cut-off Switch Mtg. Bracket
33		Record Switch Mtg. Bracket
34		Rubber Grommet
35		Pressure Roller Adj. Nut
36	1058	Pressure Roller Push Rod
37	1119	Pressure Roller Crank Sub-Asm.
38		Pressure Roller Return Spring
39	1039	Flat Washer
39A	1056	Flat Washer
40	1118	Tape Bracket Slide Asm.
41	1032	Spring
42	1032	Spring
43	1056	Flat Washer
44	1010	Head Closure Cam
45	1011	Interlock Release Cam
46	1014	Interlock Tumbler Spring
47	1013	Interlock Tumbler Spacer
48	1012	Pressure Roller Cam
49	1056	Flat Washer
50	1055	Spacer
51	1050	Drive Actuator Assembly
52	1056	Flat Washer
53		Hex. Nut, 7/16-27
54	9000-12	Locknut
55	1009	Brake Release Cam
56	1038	Brake Slide Washer
57	1030	Brake Slide Assembly
58	1037	Brake Cam Spacer
59	1038	Brake Slide Washer
60		Lockwasher
61		Hex. Nut, 1/4-28
62	1023	Coupling Spacer Shaft
63		Capstan Drive Motor
64	1133	Brake Drum
65	21131	Spindle Assembly
66	1136	Motor Mtg. Bracket
67	RTM-1	Take-up Motor
68	1040	Brake Lever Assembly (Right)
69	1044	Brake Tension Spring
70	1042	Brake Lever Assembly (Left)
71	1133	Brake Drum
72	21131	Spindle Assembly
73	1136	Motor Mtg. Bracket
74	RTM-1	Supply Motor
75	1140	Flexible Shaft Assembly
76	R-110	Cut-off Switch
77	R-114	Record Switch

ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description
V1	12AX7	Mic. Pre-Amp. -AF Amp.
V2	12AU7	AF Amp. -Recording Output
V3	12BH7	Bias Mult.
V4	12AX7	Playback Pre-Amp. -AF-Amp.
V5	12AT7	Monitor Amp. -Monitor Output
V6	12AU7	Meter Amp. -Meter Rect.
V7	6X5GT	Rectifier
C1A		Cap., Elect., 40MFD. @ 450V.
C1B		Cap., Elect., 40MFD. @ 450V.
C2		Cap., Elect., 500MFD. @ 50V.
C3		Cap., Elect., 500MFD. @ 25V.
C4A		Cap., Elect., 10MFD. @ 450V.
C4B		Cap., Elect., 10MFD. @ 450V.
C5A		Cap., Elect., 10MFD. @ 450V.
C5B		Cap., Elect., 10MFD. @ 450V.
C6		Cap., Elect., 20MFD. @ 150V.
C7		Cap., Molded Paper, .05MFD. @ 400V.
C8		Cap., Ceramic Tub., 470MMF.
C9		Cap., Mica, 200MMF. @ 500V.
C10		Cap., Molded Paper, .047MFD. @ 400V.
C11		Cap., Disc Ceramic, 5000MMF.
C12		Cap., Molded Paper, .047MFD. @ 400V.
C13		Cap., Disc Ceramic, 5000MMF.
C14		Cap., Molded Paper, .22MFD. @ 400V.
C15		Cap., Disc Ceramic, 10, 000MMF.
C16		Cap., Mica, 3000MMF. @ 500V.
C17		Cap., Mica, 3000MMF. @ 500V.
C18		Cap., Disc Ceramic, 10, 000MMF.
C19		Cap., Mica, 3900MMF. @ 500V.
C20		Cap., Disc Ceramic, 10, 000MMF.
C21		Cap., Disc Ceramic, 10, 000MMF.
C22		Cap., Mica, 500MMF. @ 500V.
C23		Cap., Tub. Ceramic, 1000MMF.
C24		Cap., Disc Ceramic, 2000MMF.
C25		Cap., Mica, 250MMF. @ 500V.
C26		Cap., Mica, 150MMF. @ 500V.
C27		Cap., Disc Ceramic, 10, 000MMF.
C28		Cap., Molded Paper, .047MFD. @ 400V
C29		Cap., Mica, 3000MMF.
C30		Cap., Disc Ceramic, 10, 000MMF.
C31		Cap., Molded Paper, .5MFD. @ 200V.
C32		Cap., Oil Filled Paper, 2.5MFD. @ 220V. AC
C33		Cap., Oil Filled Paper, 5MFD. @ 330V. AC
C34		Cap., Molded Paper, .22MFD. @ 400V.
C35		Cap., Molded Paper, .047MFD. @ 400V.
C36		Cap., Molded Paper, .047MFD. @ 400V
C37		Cap., Molded Paper, .5MFD. @ 200V.
R1	M-104	Record Gain Cont., 100KΩ, 1/2 Watt
R2	M-106	Fader Cont., 200KΩ, 1/2 Watt, Tap @ 100KΩ

ELECTRICAL PARTS LIST-Con't.

Ref. No.	Part No.	Description
R3	M-102	Bias Adj. Cont., 25KΩ, 1/2 Watt
R4	M-100	Bias Meter Set Cont., 1000Ω, 2 Watt
R5		Feedback Cont., 50KΩ, 1/2 Watt
R6		Fast Fwd. -Rewind Cont., 300Ω, 75 Watt
R7		Resistor, 1Meg., 1 Watt
R8		Resistor, 100KΩ, 1/2 Watt, 5%
R9		Resistor, 100KΩ, 1/2 Watt
R10		Resistor, 100KΩ, 1/2 Watt
R11		Resistor, 1000Ω, 1/2 Watt
R12		Resistor, 100KΩ, 1/2 Watt
R13		Resistor, 1000Ω, 1/2 Watt
R14		Resistor, 47KΩ, 1/2 Watt
R15		Resistor, 220KΩ, 1/2 Watt
R16		Resistor, 1Meg., 1/2 Watt
R17		Resistor, 220KΩ, 1/2 Watt
R18		Resistor, 4700Ω, 1 Watt
R19		Resistor, 5600Ω, 1 Watt
R20		Resistor, 470KΩ, 1/2 Watt
R21		Resistor, 22KΩ, 1 Watt
R22		Resistor, 1000Ω, 1/2 Watt
R23		Resistor, 100KΩ, 1/2 Watt
R24		Resistor, 22KΩ, 1/2 Watt
R25		Resistor, 220Ω, 1/2 Watt
R26		Resistor, 22KΩ, 1/2 Watt
R27		Resistor, 2200Ω, 1/2 Watt
R28		Resistor, 47KΩ, 1/2 Watt
R29		Resistor, 51KΩ, 1/2 Watt, 5%
R30		Resistor, 22KΩ, 1/2 Watt
R31		Resistor, 100KΩ, 1/2 Watt
R32		Resistor, 2200Ω, 1/2 Watt
R33		Resistor, 1000Ω, 1/2 Watt
R34		Resistor, 100KΩ, 1/2 Watt
R35		Resistor, 1000Ω, 1/2 Watt
R36		Resistor, 1Meg., 1 Watt, 5%
R37		Resistor, 1Meg., 1Watt, 5%
R38		Resistor, 470Ω, 1 Watt, 5%

Ref. No.	Part No.	Description
R39		Resistor, 100KΩ, 1/2 Watt, 5%
R40		Resistor, 1000Ω, 1/2 Watt
R41		Resistor, 47KΩ, 1/2 Watt
R42		Resistor, 100KΩ, 1/2 Watt
R43		Resistor, 1000Ω, 1/2 Watt
R44		Resistor, 470KΩ, 1/2 Watt
R45		Resistor, 470Ω, 1/2 Watt
R46		Resistor, 10KΩ, 1 Watt
R47		Resistor, 10KΩ, 1 Watt
R48		Resistor, 220KΩ, 1/2 Watt
R49		Resistor, 47KΩ, 1/2 Watt
R50		Resistor, 470Ω, 1/2 Watt
R51		Resistor, 10KΩ, 1/2 Watt
R52		Resistor, 2200Ω, 1 Watt
R53		Resistor, 390Ω, 1 Watt
R54		Resistor, 50Ω, 2 Watt
R55		Resistor, 500Ω, 2 Watt
R56		Resistor, 150Ω, 30Watts (Note that a 200Ω, 30Watt, adjustable resistor is used, tapped at 150Ω).
R57		Resistor, 50Ω, 10 Watts
T1	T17812	Power Transformer
L1	K-100	Erase and Bias Osc. Coil
M1		Selenium Rectifier
M2		Fuse, 5Amp., 250V, Type 3AG
M3		Fuse, 1 1/2 Amp., 250V., Type 3AG
M4		Crystal Diode
M5		Dial Light, Meter, Type #51
M6		Dial Light, Meter, Type #51
M7		On-Off Power Switch, Toggle
M8	R102	Meter Function Switch
M9	R112	Speed Selector Switch
M10		Stop-Run Switch (SPDT-Lever Type)
M11	1150	Micro-Switch Assembly, Record
M12	2U-100	Bias, Record, Output Level Meter
M13		Feedback Trimmer Cap.

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

PROPERTY OF
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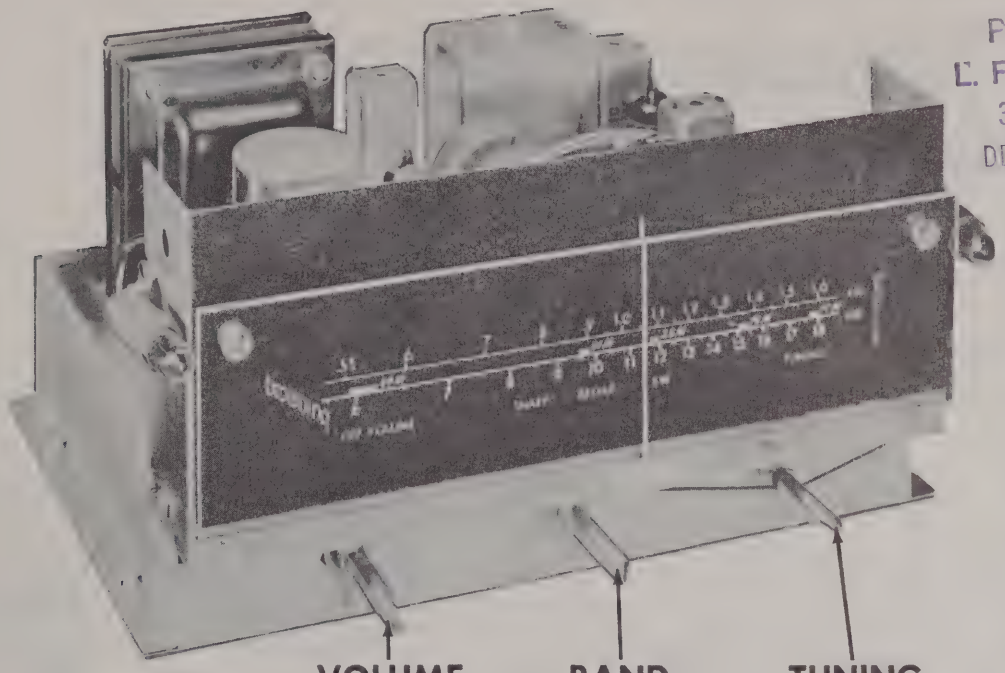
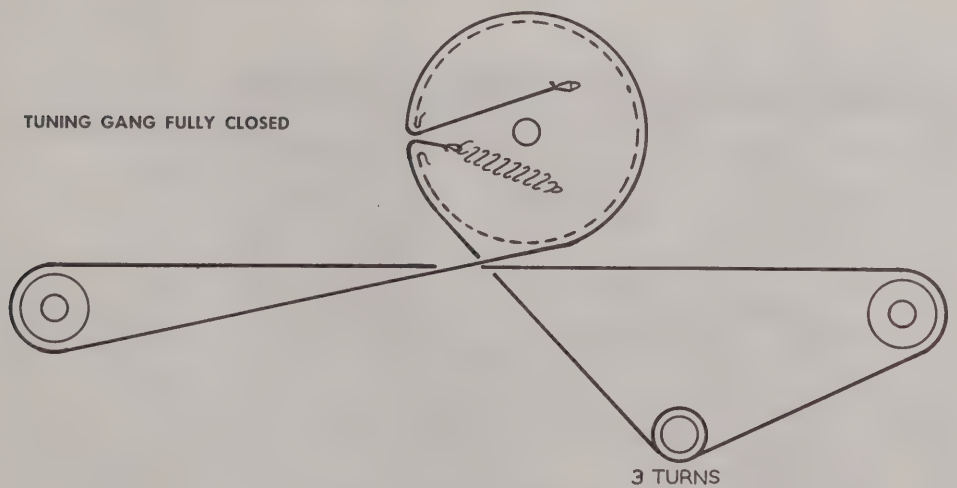
3924 MEADE ST.
DENVER, COLORADO



TRADE NAME	Browning Model L-500
MANUFACTURER	Browning Laboratories, Inc., 750 Main St., Winchester, Mass.
TYPE SET	AC Operated AM BC-SW Superheterodyne Receiver
TUBES (Seven)	Types 6BA6 RF Amp., 6BE6 Converter, 6BA6 1st. IF Amp., 6BA6 2nd. IF Amp., 6AL5 Det.-AVC, 12AX7 Cathode Follower-Cathode Follower, 6X4 Rectifier
POWER SUPPLY	105-125 Volts AC-50-60 Cycles — RATING .43 Amp. @ 117 Volts AC
TUNING RANGE--BROADCAST	540KC-1600KC — SHORT WAVE 5.8MC-18.0MC

BROWNING
MODEL L-500



DIAL CORD STRINGING

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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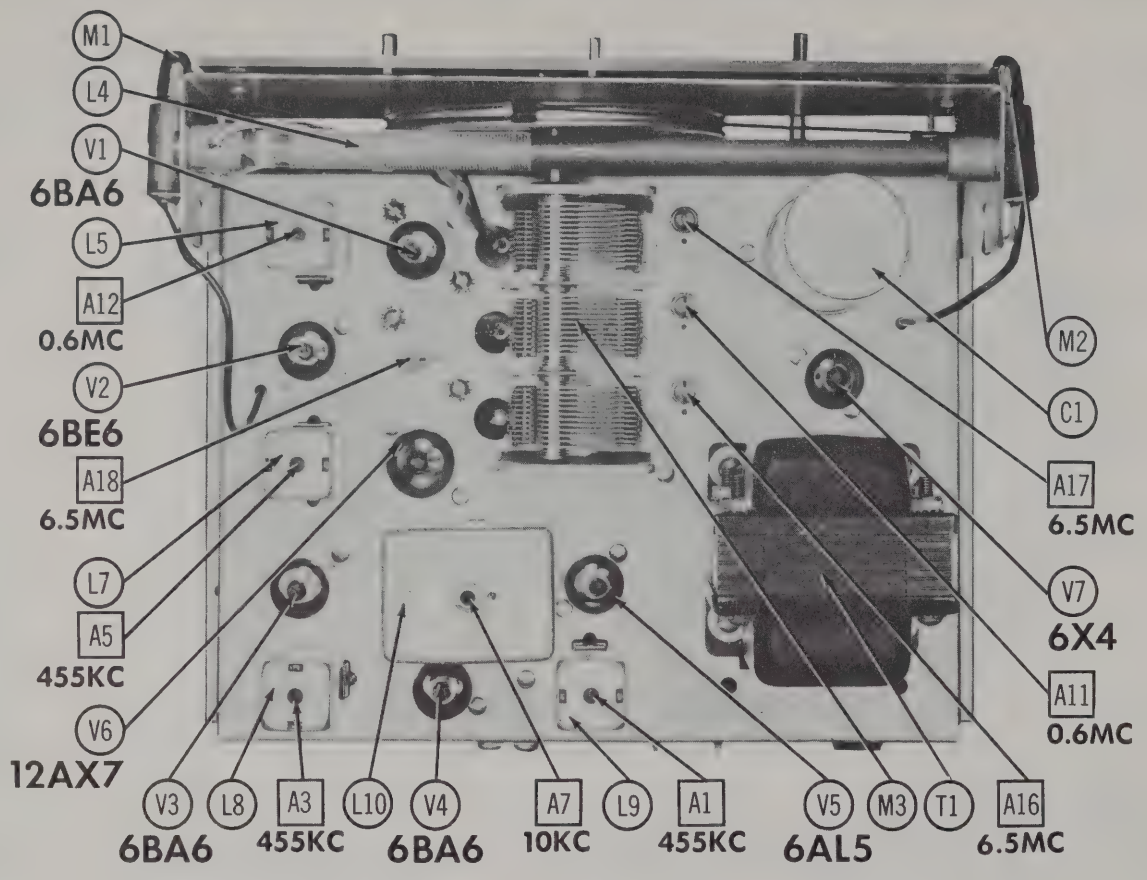
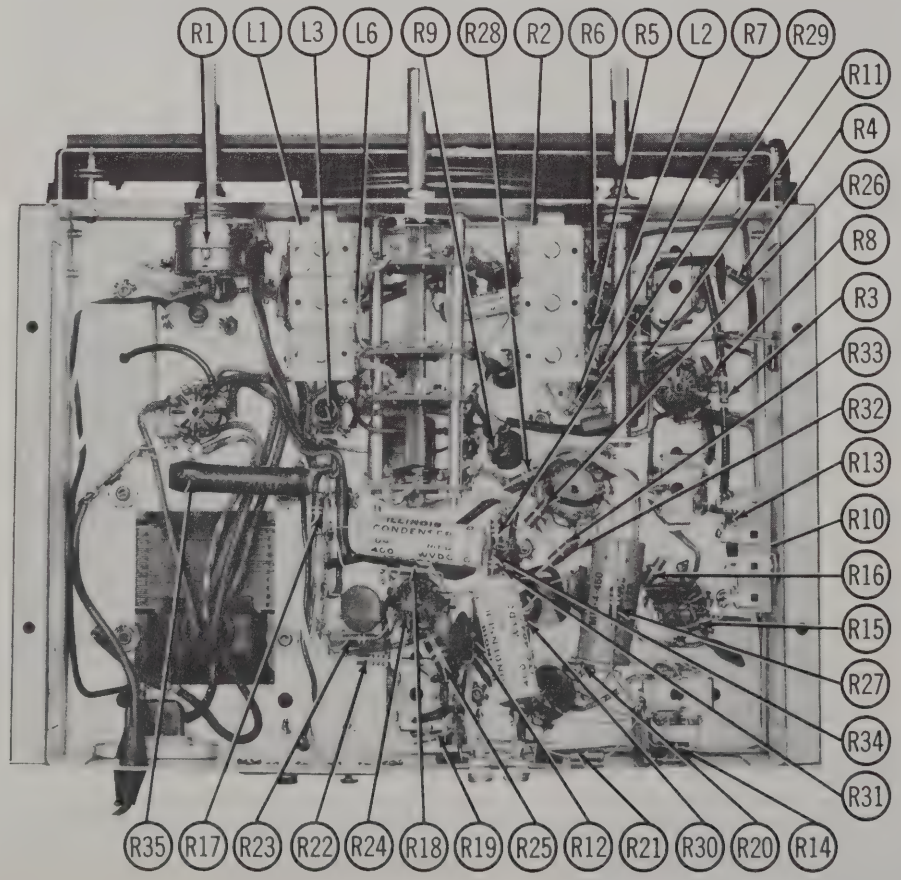
CHASSIS-TOP VIEW



CHASSIS-BOTTOM VIEW-RESISTOR IDENTIFICATION



PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		BROWNING PART No.	STANDARD REPLACEMENT		
V1	RF Amplifier	6BA6	6BA6	7BK	
V2	Converter	6BE6	6BE6	7CH	
V3	1st. IF Amp.	6BA6	6BA6	7BK	
V4	2nd. IF Amp.	6BA6	6BA6	7BK	
V5	Det.-AVC	6AL5	6AL5	6BT	
V6	Cathode Follower-Cathode Follower	12AX7	12AX7	9A	
V7	Rectifier	6X4	6X4	5BS	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	BROWNING PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲40	450		AFH2-57	B045	FP238	TM-D40-450	D-235	TVL-2764
B	▲40	450							
C2	4	450		PRS450V4	BR445	TC70	TD-4-450	FM-4504	TVA-1702

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

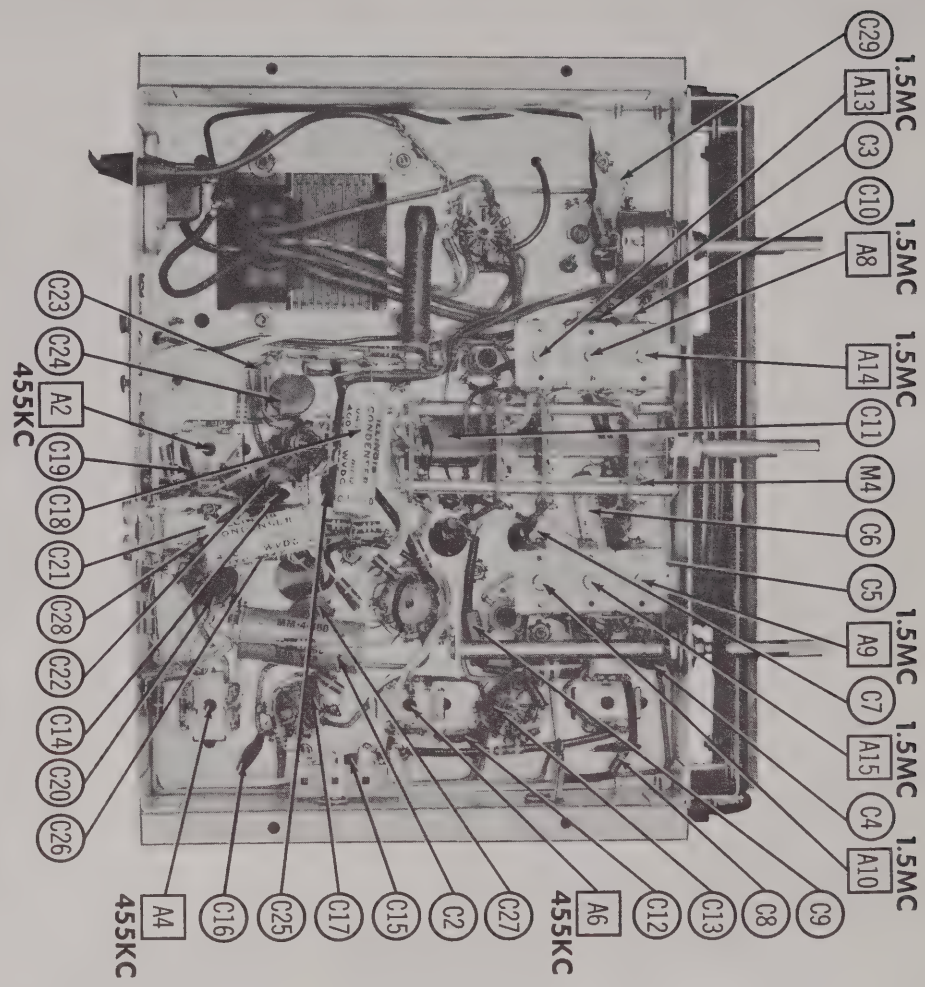
ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	BROWNING PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C4	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C5	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C6	.01	400		BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C7	10									Note 1
C8	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C9	100	500		NP0-S1100	TCZ-100	5R5T1	NP0-337-101	MCB235	5TCC-T1	
C10	430	500		1469-00043		5R5T43			MS-343	
C11	3500	500		1464-0035		1R5D35			MS-235	Note 2
C12	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C13	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C14	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C15	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C16	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C17	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C18	.047	400		BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C19	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C20	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C21	100	500		NP0-S1100	TCZ-100	5R5T1	NP0-337-101	MCB235	MS-31	
C22	100			S1100	D6-101	TP34	GP1K-101	UC-531	5GA-T1	
C23	100	500		S1100	D6-101	5W5T1	GP1K-101	MC235	1FM-31	
C24	20000			BPD-02	DD-203	K085	817-02	PT412	5HK-S2	
C25	20000			BPD-02	DD-203	K085	817-02	PT412	5HK-S2	
C26	100	500		S1100	D6-101	5W5T1	GP1K-101	MC235	1FM-31	
C27	20000			BPD-02	DD-202	K085	817-02	PT412	5HK-S2	
C28	.047	400		BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C29	.01	400		BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	

Note 1. Not used in some versions.
Note 2. Some versions may use 3000MMF in this application.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	BROWNING PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	1Meg	½		AB-70	A47-1Meg-Z	Q13-137	U-53	Volume
B	Shaft			AK-3	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch			KB-1	SWE-12	76-1	US-26	Attach to R1A

BOTTOM VIEW-CAPACITORS IDENT.



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	BROWNING PART No.	IRC PART No.	
R2	470KΩ	½		BTS-470K	
R3	2Meg	½		BTS-2.2Meg	
R4	2200Ω	½		BTS-2200	
R5	47KΩ	½		BTS-47K	
R6	100Ω	½		BTS-100	
R7	150Ω	½		BTS-150	
R8	22KΩ	½		BTS-22K	
R9	47Ω	½		BTS-47	
R10	2200Ω	½		BTS-2200	
R11	22KΩ	2		BTB-22K	
R12	1Meg	½		BTS-1Meg	
R13	470KΩ	½		BTS-470K	
R14	2200Ω	½		BTS-2200	
R15	68KΩ	½		BTS-68K	
R16	220Ω	½		BTS-220	
R17	220KΩ	½		BTS-220K	
R18	1Meg	½		BTS-1Meg	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	BROWNING PART No.	IRC PART No.	
R19	2200Ω	½		BTS-2200	
R20	68KΩ	½		BTS-68K	
R21	220Ω	½		BTS-220	
R22	47KΩ	½		BTS-47K	
R23	220KΩ	½		BTS-220K	
R24	3900Ω	½		BTS-3900	
R25	100KΩ	1		BTA-100K	
R26	1Meg	½		BTS-1Meg	
R27	27KΩ	½		BTS-27K	
R28	1800Ω	½		BTS-1800	
R29	27KΩ	½		BTS-27K	
R30	470KΩ	½		BTS-470K	
R31	1Meg	½		BTS-1Meg	
R32	1Meg	½		BTS-1Meg	
R33	1800Ω	½		BTS-1800	
R34	27KΩ	½		BTS-27K	
R35	2000Ω	10		PW10-2000	

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	BROWNING PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @.43A	560VCT .041A	6.3VAC @2.28A		NE-1687-P	P9304 ①			22R30 ①②	R-9A ①②

① Drill new mounting holes, tape @ 6.3V CT.
② Tape 5V @ 2A winding.

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	BROWNING PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	SW Ant. Coil	.1Ω	.3Ω					
L2	SW RF Coil	3.4Ω	.1Ω					
L3	SW Osc. Coil	.2Ω	.1Ω					
L4	BC Ant. Coil	.6Ω						
L5	BC RF Coil	95Ω	6.2Ω	NF-625				
L6	BC Osc. Coil	2.3Ω	4.1Ω					
L7	1st. IF	16Ω	17Ω	BI-616K				Tertiary winding - .3Ω
L8	2nd. IF	16Ω	17Ω	BI-616K				Tertiary winding -.3Ω
L9	3rd. IF	9.5Ω	9.5Ω	1655.12	16-6758	BC-353	12-C2	
L10	10KC Filter	118Ω						Includes caps and resistor

MISCELLANEOUS

ITEM No.	PART NAME	BROWNING PART No.	NOTES
M1	Dial Light		#47
M2	Dial Light		#47
M3	Tuning Cap.	3403	3 Gang (10-365MMF, 10-365MMF, 10-365MMF)
M4	Switch		Band (Rotary-wafer type)
	Trimmer Cap.		BC Osc. trimmer (4-70MMF)
	Trimmer Cap.		BC RF trimmer (4-70MMF)
	Trimmer Cap.		BC Ant. trimmer (4-70MMF)
	Trimmer Cap.		SW Osc. trimmer (4-70MMF)
	Trimmer Cap.		SW RF trimmer (4-70MMF)
	Trimmer Cap.		SW Ant. trimmer (4-70MMF)

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1.	.1MFD	High side to pin 7 (grid) of 6BE6 (V2). Low side to chassis.	455KC (400%Mod)	AM (Sharp)	Point of non-interference	DC probe to point A. Common to chassis.	A1, A2, A3, A4, A5, A6	Adjust for maximum deflection.
2.	.1MFD	"	455KC (50KC Swp)	AM (Broad)	"	USE SCOPE Vert. amp. to point A. Low side to chassis.	A3, A4, A5, A6	Adjust for curve of maximum amplitude and symmetry similar to Fig 1
				10KC WHISTLE FILTER ADJUSTMENT				
3.	.1MFD	High side to pin 7 (grid) of 6BE6 (V2). Low side to chassis.	10KC (Unmod)	AM (Sharp)		USE OUTPUT METER Across audio output jack.		Adjust for MINIMUM output.
				RF ALIGNMENT				

Before aligning check setting of dial pointer. With tuning gang fully closed dial pointer should coincide with white dot at extreme left end of SW dial.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
4.	.1MFD	Across antenna terminals.	1.5MC	AM (Sharp)	1.5MC	DC probe to point A. Common to chassis.	A8, A9, A10	Adjust in order given for maximum deflection.
5.	"	"	0.6MC	"	0.6MC	"	A11, A12	Adjust in order given for maximum deflection. Repeat steps 4 and 5 for calibration and tracking.
6.	"	"	15MC	SW	15MC	"	A13, A14, A15	Adjust in order given for maximum deflection. If two settings are found, adjust A13 to setting nearest minimum capacity and A15 to setting nearest maximum capacity.
7.	"	"	6.5MC	"	6.5MC	"	A16, A17, A18	Adjust in order given for maximum deflection. Repeat steps 6 and 7 for calibration and tracking.

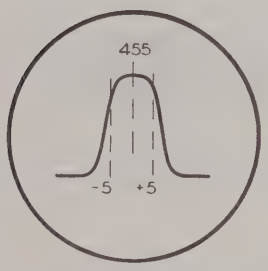
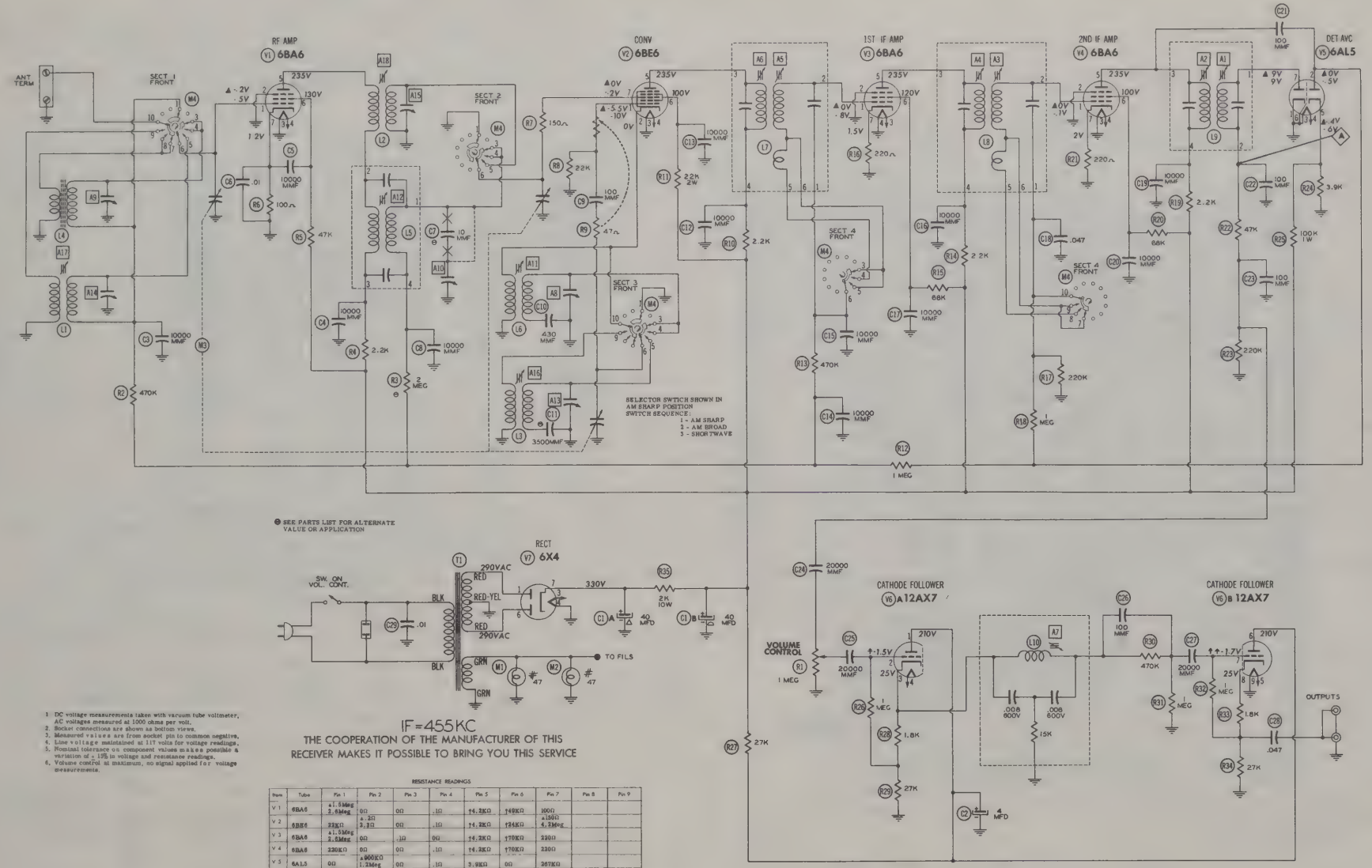


FIG. 1

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO



IF=455KC

THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

1. DC voltage measurements taken with vacuum tube voltmeter, AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BA6	▲1.5Meg 2.6Meg	0Ω	0Ω	.1Ω	†4.2KΩ	†49KΩ	100Ω		
V 2	6BE6	22KΩ	▲.2Ω 2.1Ω	0Ω	.1Ω	†4.2KΩ	†24KΩ	▲150Ω 4.2Meg		
V 3	6BA6	▲1.5Meg 2.6Meg	0Ω	.1Ω	0Ω	†4.2KΩ	†70KΩ	230Ω		
V 4	6BA6	220KΩ	0Ω	0Ω	.1Ω	†4.2KΩ	†70KΩ	230Ω		
V 5	6AL5	0Ω	▲900KΩ 1.2Meg	0Ω	.1Ω	3.9KΩ	0Ω	267KΩ		
V 6	12AX7	†29KΩ	1Meg	28.8KΩ	.1Ω	.1Ω	†29KΩ	1Meg	28.8KΩ	0Ω
V 7	6X4	250Ω	NC	.1Ω	0Ω	NC	250Ω	40KΩ		

ALL MEASUREMENTS TAKEN IN AM-SHARP POSITION UNLESS DESIGNATED OTHERWISE.
▲ MEASURED IN SHORTWAVE POSITION
† MEASURED FROM PIN 3 OF V6.
† MEASURED FROM PIN 7 OF V7.
†† MEASURED FROM PIN 8 OF V8.
NC - NO CONNECTION.

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CBS-COLUMBIA MODEL 23TS005

TRADE NAME	CBS-Columbia	MODELS	CHASSIS
		23CS013, 23CS014, 23TS005, 23TS006, 23TS007, 23TS008	1603
		U23CS013, U23CS014, U23TS005, U23TS006, U23TS007, U23TS008	1604
		22CK009, 22CK010, 22TK301, 22TK321	1605
		U22TK301, U22TK321	1606
		23CK011, 23CK012, 23TK001, 23TK002, 23TK003, 23TK004	1607
		U23TK001, U23TK002, U23TK003, U23TK004	1608
MANUFACTURER	CBS-Columbia, A Division of Columbia Broadcasting System, Inc., 48-50 34th. St., Long Island City, N.Y.		
TYPE SET	Television Receiver		
TUBES	Sixteen		
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING 1.24 Amp. @ 117 Volts AC	
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)		

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DISASSEMBLY INSTRUCTIONS

CABINET REMOVAL

For replacement of tubes an access plate may be removed on the bottom pan. Remove 3 metal screws. Remove plate.

1. Remove 7 metal screws. Disconnect antenna leads. Remove rear cover.

2. Disconnect speaker plug.

3. Remove 6 metal screws holding cabinet to chassis bottom pan. Remove cabinet by forcing bottom out and lifting off.

4. Remove 2 speaker nuts. Remove speaker.

NOTE: If it is necessary to remove the chassis for servicing, it is necessary to remove the speaker. The filter choke and audio output transformer are mounted on the speaker and must be connected for proper operation.

CHASSIS

1603, 1604, 1605, 1606, 1607, 1608

CBS-COLUMBIA MODELS U22TK301, U22TK321, U23CS013, 014, U23TK001, 2, 3, 4, U23TS005, 6, 7, 8, 22CK009, 010, 22TK301, 321, 23CK011, 012, 23CS013, 014, 23TK001, 2, 3, 4, 23TS005, 6, 7, 8 (Ch. 1603, 1604, 1605, 1606, 1607, 1608)

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustment of the VHF tuner oscillator circuit may be made thru a hole in the receiver bottom pan.

PICTURE TUBE SAFETY GLASS CLEANING

For picture tube safety glass cleaning, it is necessary to remove chassis. (See disassembly instructions).

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION

See tube placement chart on page 5.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjustment of the horizontal oscillator circuit can be made from the rear panel of the chassis. Set the horizontal hold control at the mid-position of its range and adjust the horizontal frequency slug (L21) until the picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, it is necessary to remove the rear cover and supply power to set. Adjust the AM rejection control (R5) for maximum volume and minimum buzz.

FUSES

One fuse is used for LV power supply protection. (For location see tube placement chart).

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

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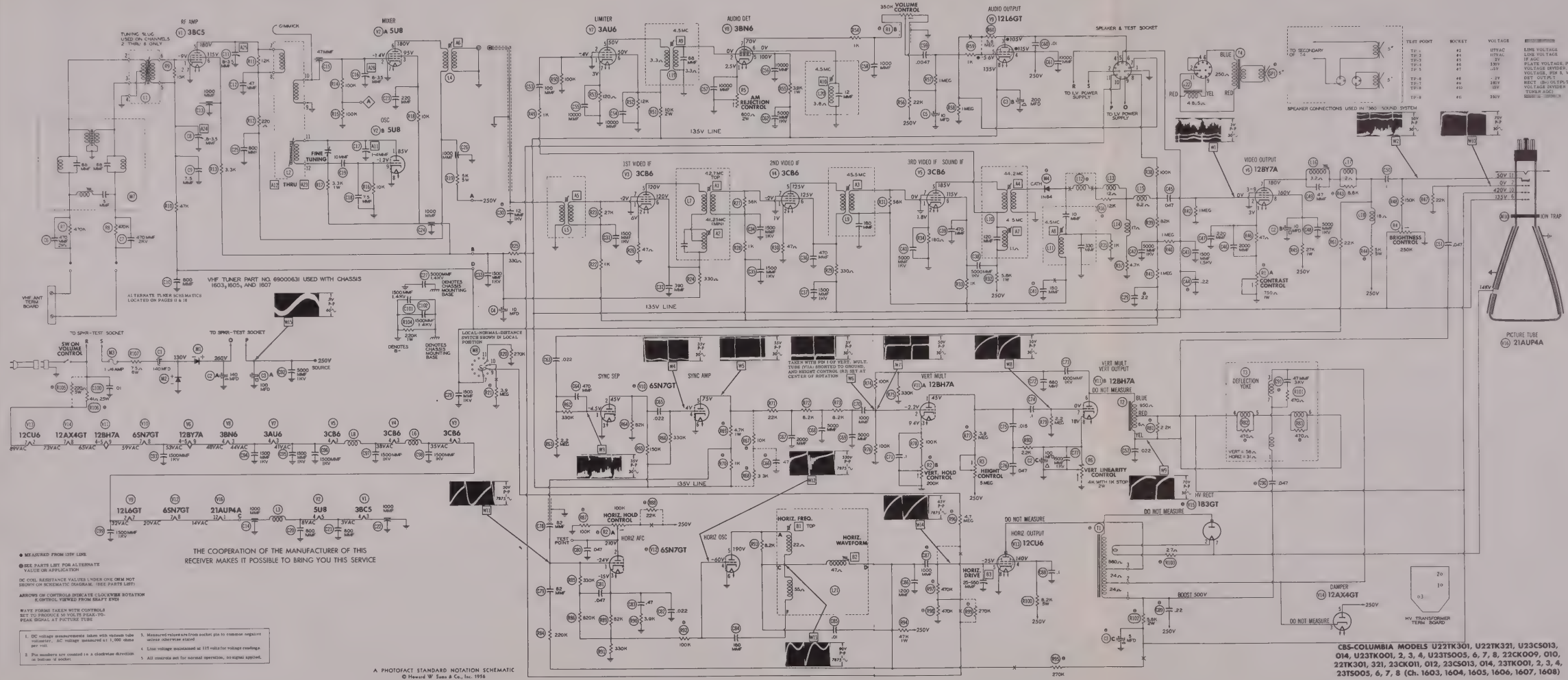
RF AMP V1 3BC5
MIXER V2A 5U8
OSC V2B 5U8
LIMITER V7 3AU6
AUDIO DET V8 3BN6
AUDIO OUTPUT V9 12L6GT
1ST VIDEO IF V3 3CB6
2ND VIDEO IF V4 3CB6
3RD VIDEO IF SOUND IF V5 3CB6
VIDEO OUTPUT V6 12BY7A
PICTURE TUBE V16 21AUP4A
SYNC SEP V10 6SN7GT
SYNC AMP
VERT MULT V11A 12BH7A
VERT MULT VERT OUTPUT V11B 12BH7A
HORIZ OSC
HORIZ AFC V12 6SN7GT
HORIZ OUTPUT V13 12CU6
HV RECT V15 1B3GT
DAMPER V16 12AX4GT
SW ON VOLUME CONTROL
VHF TUNER PART NO. 69000631 USED WITH CHASSIS 1603, 1605, AND 1607
ALTERNATE TUNER SCHEMATICS LOCATED ON PAGES 11 & 18
THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
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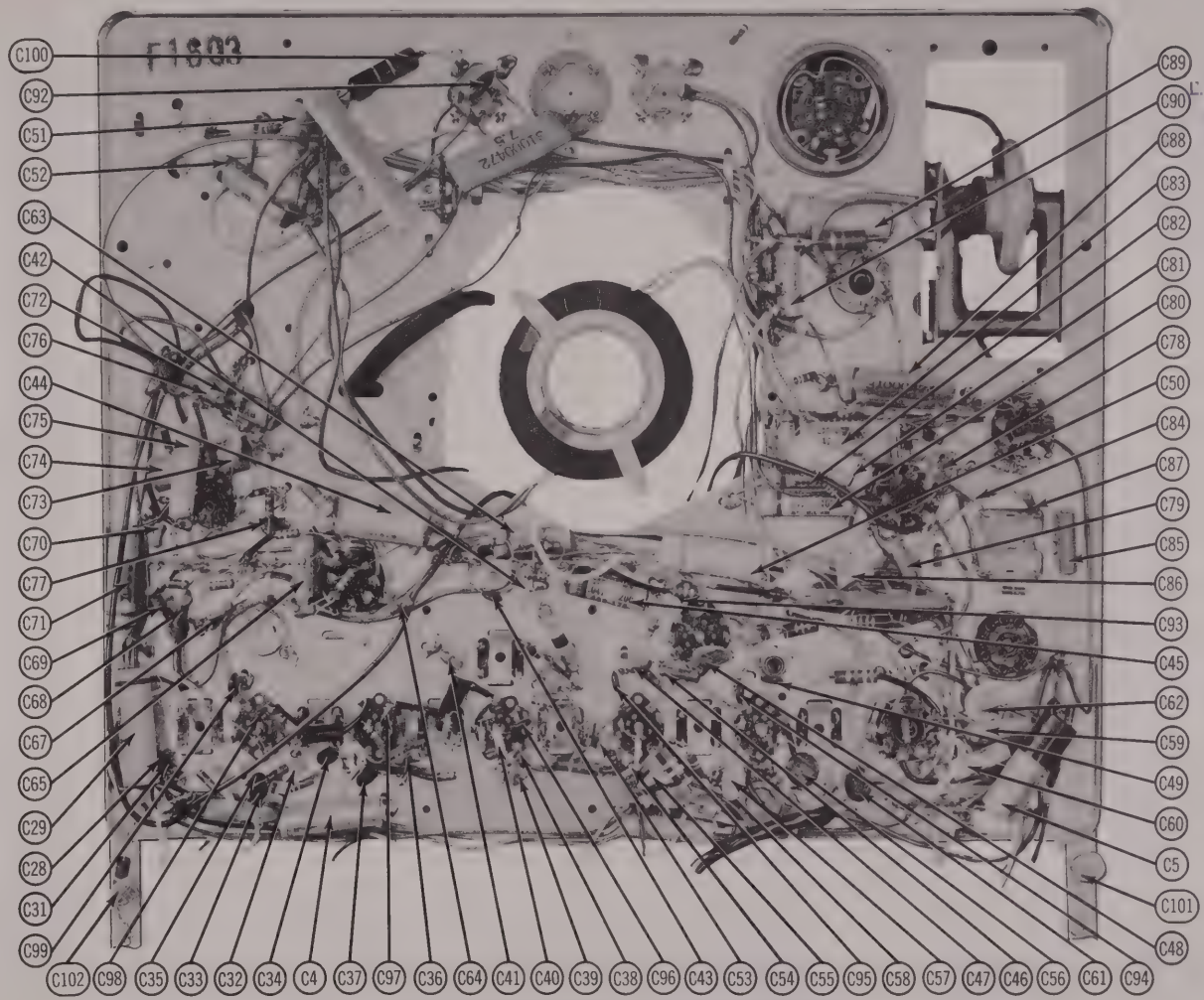

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CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

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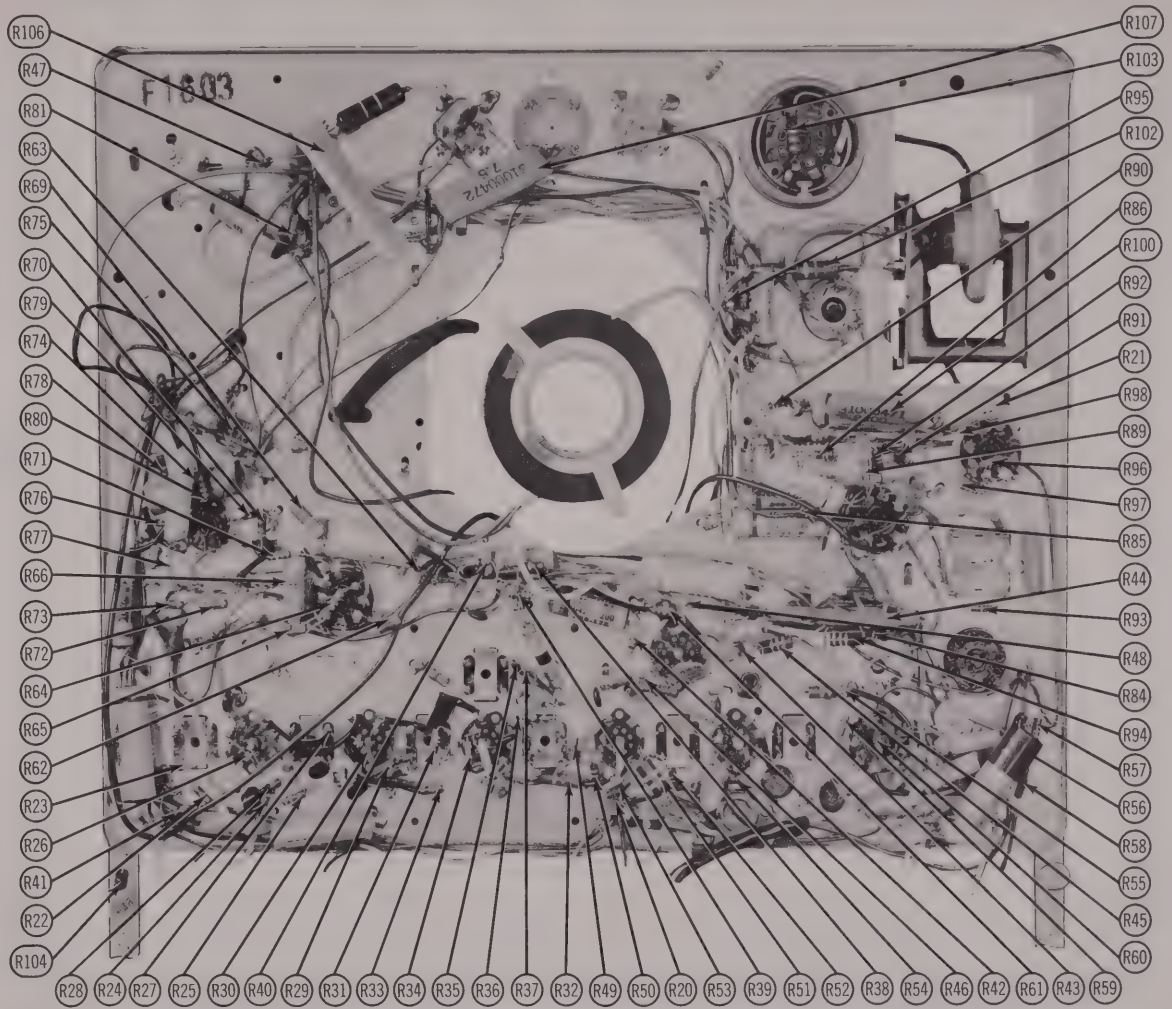

CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

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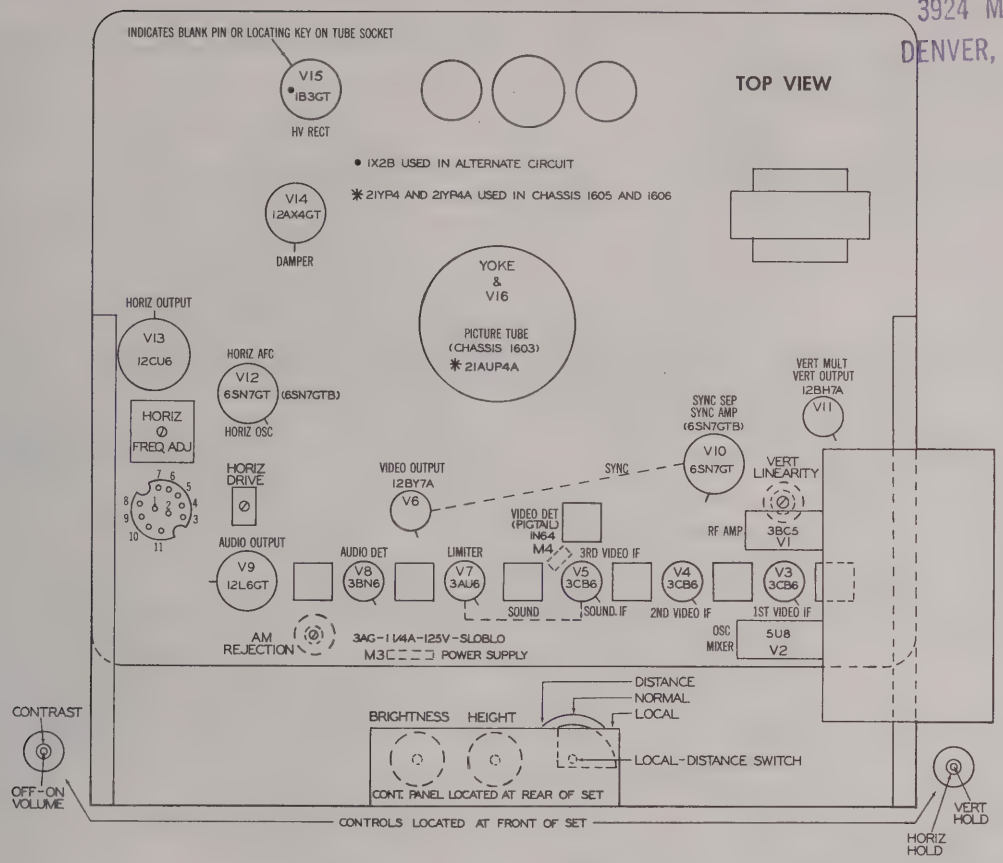
TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

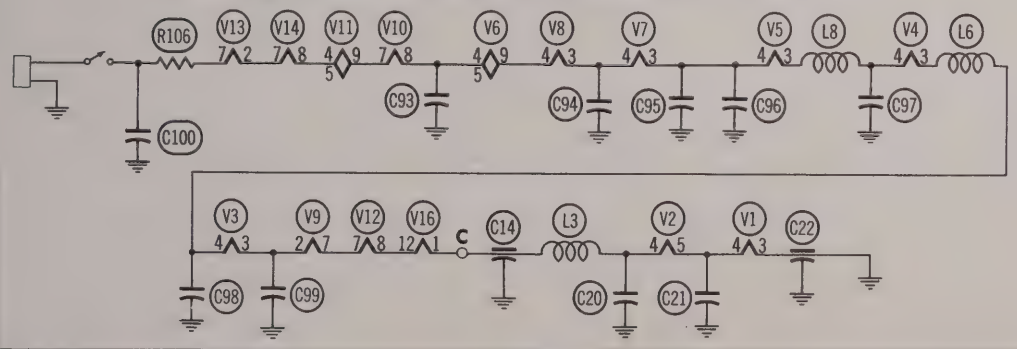
POWER SUPPLY FAILURE
No raster, no sound - **Selenium Rectifiers (M1 & M2), Fuse (M3)**

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V2, V3, V4, V5, V9**
No pic, no sound, has snow - **V1, V2, V3**
No pic, has sound, has raster - **V6, V16**
Has pic, no sound - **V7, V8, V9**

SYNC FAILURE
No vert. sync - **V10, V11**
No horiz. sync - **V10, V12**
No vert. or horiz. sync - **V10**

SWEEP FAILURE
No raster, has sound - **V12, V13, V14, V15, V16**
No vertical deflection - **V11**
Poor vert. linearity or foldover - **V11**
Poor horiz. linearity or foldover - **V12, V13, V14**
Narrow picture - **V12, V13, V14, V15, M1, M2**
Vert. off freq. - **V10, V11**
Horiz. off freq. - **V10, V12**

NOTE: Since this receiver employs tubes used in a series-parallel filament network, an open filament in any tube in series may cause the set to be inoperative. (See circuit below).



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ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage shock hazard may be eliminated by disconnecting the ground lead from the cathode (pin 8) of 12CU6 horizontal output tube.

VIDEO IF ALIGNMENT

Set local-distant switch to normal position.
Connect negative lead of 3 volt bias supply to ungrounded side of C44. Positive lead to chassis.
Use lowest possible VTVM range for all steps.
Remove channel 13 oscillator strip from tuner.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	.001MFD	High side to pin 1 of V3. Low side to chassis.	42.7MC (Unmod)	13	DC probe to pin 8 of test socket. Low side to chassis.	A1	Adjust for maximum deflection.
2.	"	"	41.25MC	"	"	A2	Adjust for MINIMUM deflection.
3.	"	"	45.5MC	"	"	A3	Adjust for maximum deflection.
4.	"	"	44.2MC	"	"	A4	Adjust for maximum deflection.

OVERALL VIDEO IF RESPONSE CHECK

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
Attenuate sweep generator output to maintain 3 volts peak to peak vertical deflection on scope. Leave bias connected to ungrounded side of C44

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
5.	Direct	High side to ungrounded tube shield floating over mixer-osc. tube. Low side to chassis.	43MC (10MC Swp)	42.45MC 45.75MC	13	Vert. Amp. to pin 8 of test socket. Low side to chassis.	A5, A6	Adjust A5 and A6 to place markers in position as in Fig. 1. If necessary, retouch A1, A3 and A4 for correct response as in Fig. 1.

SOUND IF ALIGNMENT

Increase bias supply to 6 volts and set local-distant switch to local position.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
6.	.01MFD	High side to junction of L12 and L31. Low side to chassis.	4.5MC (400% AM Mod. 30%)	13	Across audio output transformer secondary.	A7, A8, A9	Adjust for maximum deflection.
7.	"	"	4.5MC (25KC FM)	"	"	A10	Set volume control to approximately center. Adjust A10 for maximum deflection of meter.
8.	"	"	4.5MC (400% AM 30% Mod)	"	"	R5	Adjust for MINIMUM deflection. Repeat step 7.

ALTERNATE SOUND IF ALIGNMENT USING TV SIGNAL

1. Tune the receiver to a strong TV signal and adjust for best picture. Set "AM Rejection" control at the center of its range. Attenuate signal (remove antenna and/or set local-distant switch to local position) until a hiss is heard in the sound. Adjust A7, A8 and A9 for maximum sound.
2. Increase signal level to normal and adjust A10 for maximum sound and minimum buzz.
3. Attenuate signal again and adjust R5 for minimum hiss and noise.
4. Increase signal level to normal and rotate the fine tuning control. If the buzz is still present, readjust A10 for clearest sound and minimum buzz.

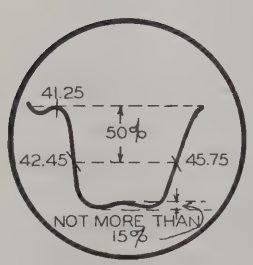


FIG. 1

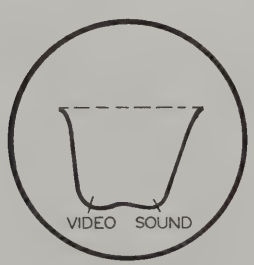


FIG. 2

ALIGNMENT INSTRUCTIONS (cont)

VHF OSCILLATOR ALIGNMENT

Replace channel 13 oscillator strip in tuner.
Complete oscillator alignment may not be necessary. If the oscillator seems to be off frequency, approximately the same amount for a majority of the channels it may be possible to correct them in one step using All. It should be noted that this is an all channel adjustment and should not be used to correct any individual channel. If adjustment of All will not bring all channels well within range of the fine tuning control, it will be necessary to adjust the channel strip adjustment screw for each channel that is off frequency. The oscillator adjustment screws are accessible thru a hole in the bottom of the chassis mounting pan. The correct adjustment screw accessible thru this hole as the channel switch is turned to each channel.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. to pin 8 of test socket. Low side to chassis.	A12	Adjust to place sound marker in trap notch as in Fig. 2.
			207MC (10MC Swp)	205.25MC 209.75MC	12		A13	
			201MC (10MC Swp)	199.25MC 203.75MC	11		A14	
			195MC (10MC Swp)	193.25MC 197.75MC	10		A15	
			189MC (10MC Swp)	187.25MC 191.75MC	9		A16	
			183MC (10MC Swp)	181.25MC 185.75MC	8		A17	
			177MC (10MC Swp)	175.25MC 179.75MC	7		A18	
			85MC (10MC Swp)	83.25MC 87.75MC	6		A19	
			79MC (10MC Swp)	77.25MC 81.75MC	5		A20	
			69MC (10MC Swp)	67.25MC 71.75MC	4		A21	
			63MC (10MC Swp)	61.25MC 65.75MC	3		A22	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A23	

VHF RF AND MIXER ALIGNMENT

Connect the negative lead of a 3 volt bias supply to the ungrounded side of C44. Positive lead to chassis.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
10.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	207MC (10MC Swp)	205.25MC 209.75MC	12	Vert. Amp. thru 22KΩ to point (A). Low side to chassis.	A24, A25, A26	Adjust for response curve similar to Fig. 2 with markers above 90%.
11.	"	"	213MC (10MC Swp)	211.25MC 215.75MC	13	"	"	Check for response similar to Fig. 2. If markers fall below 70% on any channel make SLIGHT compromise adjustment of A24, A25 and A26 with channel switch set to that channel. Recheck all other channels to see that they have not been seriously affected.
			201MC (10MC Swp)	199.25MC 203.75MC	11			
			195MC (10MC Swp)	193.25MC 197.75MC	10			
			189MC (10MC Swp)	187.25MC 191.75MC	9			
			183MC (10MC Swp)	181.25MC 185.75MC	8			
			177MC (10MC Swp)	175.25MC 179.75MC	7			
			85MC (10MC Swp)	83.25MC 87.75MC	6			
			79MC (10MC Swp)	77.25MC 81.75MC	5			
			69MC (10MC Swp)	67.25MC 71.75MC	4			
			63MC (10MC Swp)	61.25MC 65.75MC	3			
			57MC (10MC Swp)	55.25MC 59.75MC	2			

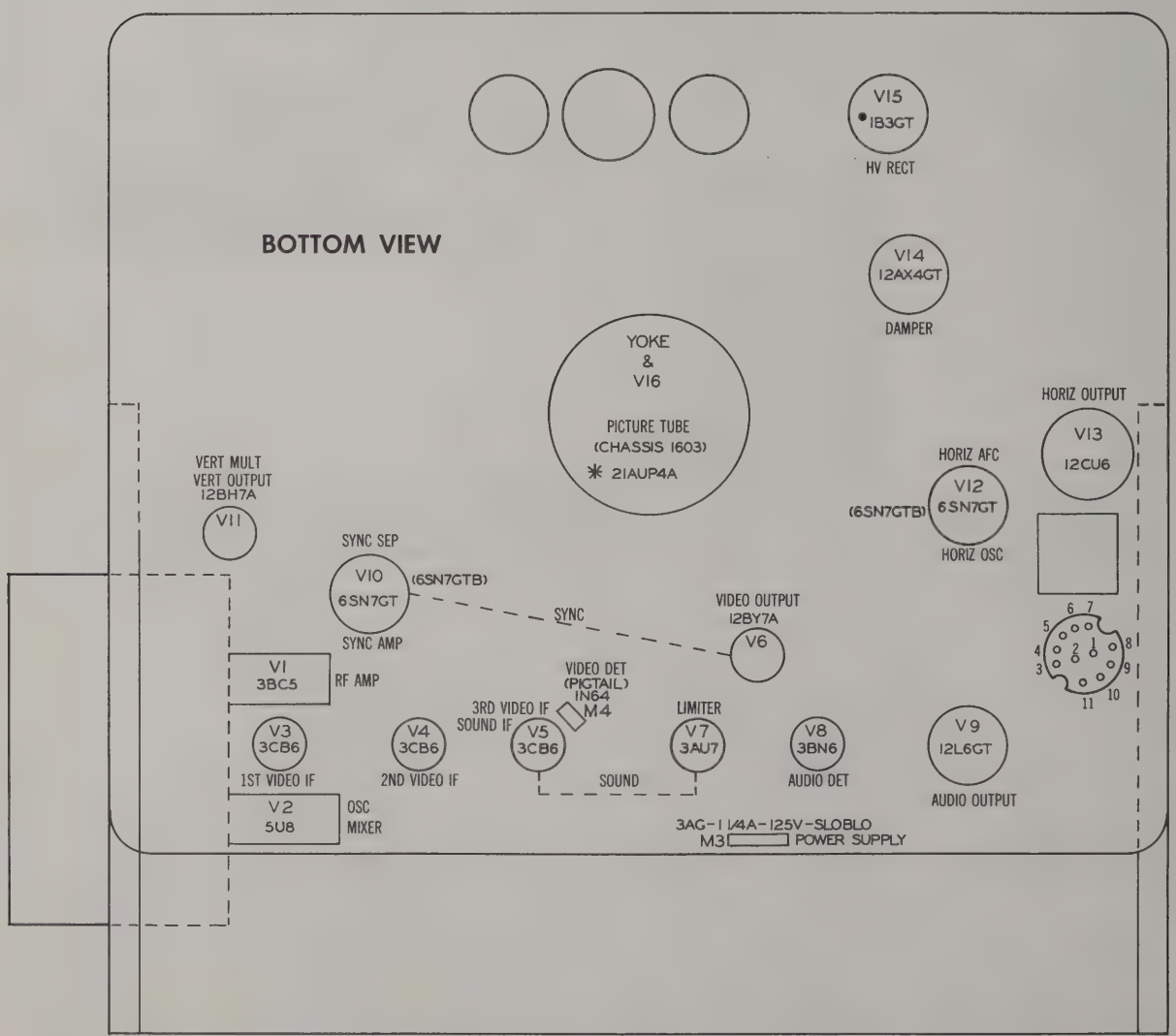
UHF TUNER ALIGNMENT

The UHF tuner portion of this receiver was aligned at the factory and is very stable. Alignment of the UHF portion is not recommended in the field.

RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	3BC5	1Meg	0Ω	0Ω	1Ω	† 5. 2KΩ	■ 3. 6KΩ	0Ω		
V 2	5U8	■ 3. 6KΩ	200KΩ	■ 10KΩ	2Ω	1Ω	† 5KΩ	0Ω	0Ω	10KΩ
V 3	3CB6	1Meg	47Ω	8Ω	9Ω	■ 660Ω	■ 660Ω	0Ω		
V 4	3CB6	1Meg	47Ω	9Ω	10Ω	■ 330Ω	■ 330Ω	0Ω		
V 5	3CB6	1KΩ	180Ω	10Ω	11Ω	† 5. 6KΩ	■ 1KΩ	0Ω		
V 6	12BY7A	220Ω	1Meg	0Ω	14Ω	14Ω	13Ω	† 5KΩ	† 27KΩ	0Ω
V 7	3AU6	100KΩ	0Ω	11Ω	12Ω	■ 10KΩ	■ 10KΩ	120Ω		
V 8	3BN6	300Ω	3. 3Ω	12Ω	13Ω	■ 3. 9KΩ	3. 8Ω	† 375KΩ		
V 9	12L6GT	TP	8Ω	† 300Ω	† 50Ω	550KΩ	TP	5Ω	18KΩ	
V 10	6SN7GT	2. 5Meg	■ 60KΩ	0Ω	350KΩ	■ 5. 7KΩ	0Ω	16Ω	14Ω	
V 11	12BH7A	† 5Meg	90KΩ	170KΩ	17Ω	17Ω	▲ 6. 5KΩ	2. 2Meg	1. 6KΩ	16Ω
V 12	6SN7GT	1. 5Meg	† 25KΩ	400KΩ	430KΩ	† 47KΩ	0Ω	5Ω	4Ω	
V 13	12CU6	TP	20Ω	TP	† 8. 2KΩ	1Meg	TP	23Ω	0Ω	TOP CAP ▲ 24Ω
V 14	12AX4GT	NC	NC	320KΩ	NC	† 50Ω	NC	20Ω	17Ω	
V 15	1B3GT		PINS	1-8	HAVE	INF	RESISTANCE			TOP CAP ▲ 884Ω
V 16	21AUP4A	2Ω	22KΩ	PIN 6 18KΩ	PIN 10 ▲ 5. 6KΩ	PIN 11 ■ 200KΩ	PIN 12 4Ω			

† MEASURED FROM OUTPUT OF M2.
■ MEASURED FROM 135 V LINE.
▲ MEASURED FROM PIN 3 OF V14.
TP-TIE POINT
NC-NO CONNECTION



TUBE PLACEMENT CHART

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ALTERNATE VHF-UHF TUNER SCHEMATIC

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TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: CBS-Columbia PART No.	STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	RF Amp.	3BC5	3BC5	7BD	
V2	Osc. Mixer	5U8	5U8	9AK	
V3	1st Video IF Amp.	3CB6	6CB6	7CM	
V4	2nd Video IF Amp.	3CB6	3CB6	7CM	
V5	3rd Video IF Amp. Sound IF Amp.	3CB6	3CB6	7CM	
V6	Video Output	12BY7A	12BY7A	9BF	
V7	Limiter	5AU8	5AU8	7BJ	
V8	Audio Det.	3BN6	3BN6	7DF	
V9	Audio Output	1SL6GT	1SL6GT	7AC	
V10	Sync Sep.- Sync Amp.	6SN7GT	6SN7GT	8BD	6SN7GTB may be used as an alternate.
V11	Vert. Mult.- Vert. Output	12BH7A	12BH7A	9A	
V12	Horiz. AFC- Horiz. Osc.	6SN7GT	6SN7GT	8BD	6SN7GTB may be used as an alternate.
V13	Horiz. Output	12CU6	6AM	7AN	
V14	Damper	12AX4GT	12AX4GT	7AN	
V15	HV Rect.	1B3GT	1B3GT	3C	1KX8 used in an alternate circuit.

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA: CBS-Columbia PART No.	CBS PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	WESTINGHOUSE PART No.	RETMA BASE TYPE	NOTES
V16	21AUP4A ①	21AUP4A ① 21AUP4 21TP4 21YP4A ①	21AUP4A ① 21AUP4	21AUP4A ① 21AUP4 21AUP4A/B ①	21AUP4A ① 21AUP4	L1L L1L L1L L1L	① Aluminized ② Silver Screen "B5"

ELECTROLYTIC CAPACITORS

ITEM No.	RATING: CAP.	VOLT	REPLACEMENT DATA: CBS-Columbia PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1	140	200	21000981	AFBH1-37-35	XA004	FP131	TM-150-250	S-150	TVL-1540
C3A	±140	350	21001001			FP451.3	TM-3033	Q-323	
B	±10	300					TD-100-25		
C	±100	25							
C5A	±100	350	21001201			FP384.14		Q-185	
B	±200	150						MT-4710	
C	-5	475	(Note 1)						
C4	10	150	21001081	PRS150Y40	BR4015	TC42	TD-10-150	FM-1512	TVA-1415
C5	10	300	21001071	PRS300Y10	BR1235	TC82	TD-12-350	FM-3512	TVA-1504

Note 1. In some versions, C3C is rated at 500V (C3 part #21000981).

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	VOLT	REPLACEMENT DATA: CBS-Columbia PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C6	470	3000		HVD-30-470	DD30-471	VT747	3KV-471	DC30347	30GA-T47	
C7	470	20		HVD-30-470	DD30-471	VT747	3KV-471	DC30347	30GA-T47	
C8	.8-3.5									
C9	7.5									
C10	600			BPD-0008	DD-801	K067	831-801	DC-521	5GA-T8	
C11	.8-3.5									
C12	47			BPD-00047	DD-470	GG33	831-470	UC-5447	5GA-Q47	
C13	1000									
C14	1000									
C15	47			MPT-50						
C16	.8-3.5									
C17	1-4			824-4		3115-01-10	CT551			
C18	7.5									
C19	10									
C20	600			BPD-0008	DD-801	K067	831-801	DC-521	5GA-T8	
C21	600			BPD-0008	DD-801	K067	831-801	DC-521	5GA-T8	
C22	1000									
C23	220			BPD-00022	DD-321	G061	831-321	UC-5322	5GA-T22	
C24	1000									
C25	600			BPD-0008	DD-801	K067	831-801	DC-521	5GA-T8	
C26	1000									
C27	5000	1400	23067020	HVD-15-4700		VD47	1R5KV-472		20HK-D5	
C28	1500	1000	23066840	HVD-15-1500	DD-152	VD15	1R5KV-152	DC30215	10GA-D15	
C29	.22	200		P288N-22		CUB22P22		PT4022	2TM-P22	Note 2
C30	20	1000	23060790							Note 3
C31	1500	1000	23066840	HVD-15-1500	DD-152	VD15	1R5KV-152	DC30215	10GA-D15	
C32	330	1000	23062190	82390	D6-391	TP94	GP2K-391	UC-5339	5GA-T39	
C33	1500	1000	23066840	HVD-15-1500	DD-152	VD15	1R5KV-152	DC30215	10GA-D15	
C34	1500	1000	23066840	HVD-15-1500	DD-152	VD15	1R5KV-152	DC30215	10GA-D15	
C35	1500	1000	23066840	HVD-15-1500	DD-152	VD15	1R5KV-152	DC30215	10GA-D15	
C36	470	1000	23062200	81470	D6-471	TP46	GP2K-471	UC-5347	5GA-T47	
C37	5000	1400	23066840	HVD-15-1500	DD-152	VD15	1R5KV-152	DC30215	10GA-D15	
C38	5000	1000	23066840	HVD-15-4700	DD-502	VD47	1R5KV-472		20HK-D47	
C39	470		23002200	81470	D6-471	TP46	GP2K-471	UC-5347	5GA-T47	
C40	5000	1000	23066840	HVD-15-4700	DD-502	VD47	1R5KV-472		20HK-D47	
C41	180			82180	D6-181	TP97	GP2K-181		5GA-T18	Note 3
C42	5000	1000	23066880	HVD-15-4700	DD-502	VD47	1R5KV-472		20HK-D47	
C43	1500	1500	23066440	HVD-15-1500	DD-152	VD15	1R5KV-152	DC30215	10GA-D15	
C44	.22	200								Note 3
C45	.047	200	23012340	BPD-05	DF-503	CUB5247		PT4047	5TM-S47	
C46	2000		23000591	812000	D6-202	TP98	GP2-333-302	UC-422	5HK-D2	
C47	220		23001180	82220	D6-221	TP99	GP2K-221	UC-5322	5GA-T22	
C48	5600	1000	23066880	HVD-15-4700	DD-502	VD47	1R5KV-472		20HK-D47	
C49	47			NP0-8147	D6-470	T223	831-470	MC5223	5TCC-Q47	
C50	.1	400	23012780	P488N-1	DF-104	CUB4P1		PT401	4TM-P1	
C51	.047	600	23012340	BPD-05	DF-503	CUB5S47		PT4047	5TM-S47	
C52	.022	600	23012300	BPD-03	DF-303	CUB5S22	817-03	PT4122	5TM-S22	
C53	100		23001830	81100	D6-101	TP94	GP2K-101	UC-531	5GA-T1	

PARTS LIST AND DESCRIPTIONS

CAPACITORS (cont)

ITEM No.	RATING: CAP.	VOLT	REPLACEMENT DATA: CBS-Columbia PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C54	10000		23066020	BPD-01	DD-103	K083	811-01	DC-511	5HK-S1	
C55	10000		23066020	BPD-01	DD-103	K083	811-01	DC-511	5HK-S1	
C56	10000		23066020	BPD-01	DD-103	K083	811-01	DC-511	5HK-S1	
C57	10000		23066020	BPD-01	DD-103	K083	811-01	DC-511	5HK-S1	
C58	1000		23001740	821000	D6-102	TP53	GP2L-102	UC-531	5HK-D1	
C59	.0047	400	23012690	814700	D6-472	CUB5D47	GP3-333-472	PT6247	6TM-D47	
C60	.01	400	23012680	BPD-01	DF-103	CUB5S1	GP3-333-103	PT401	4TM-S1	
C61	10000		23066020	BPD-01	DD-103	K083	811-01	DC-511	5HK-S1	
C62	5000	1000	23066480	HVD-15-4700	DD-502	VD47	1R5KV-472		20HK-D47	
C63	.033	400	23012700	BPD-03	DF-303	CUB4S33	817-03	PT4123	4TM-S33	
C64	470		23002200	81470	D6-471	TP46	GP2K-471	UC-5347	5GA-T47	
C65	.022	400	23012700	BPD-03	DF-303	CUB4S22	817-03	PT4122	4TM-S22	
C66	.47	200	23012360	P288N-47		CUB5P47		PT4047	5TM-P47	Note 3
C67	2000		23000591	812000	D6-202	TP56	GP3-333-302	UC-522	5HK-D2	
C68	5000		23000601	815000	D6-502	TP64	GP3-333-502	UC-5323	5HK-D5	
C69	5000		23000601	815000	D6-502	TP64	GP3-333-502	UC-523	5HK-D5	
C70	1000		23001240	1494-001		1R5D1	811-103	MC1S5	MS-S1	
C71	.1	200	23012160	P288N-1	DF-104	CUB5P1		PT4101	5TM-P1	
C72	680		23001730	82680	D6-681	TP50	GP2L-103	UC-5365	5GA-T68	
C73	1000	1000	23066010	HVD-15-1000	DD-102	VD1	1R5KV-103	DC3521	10GA-D1	
C74	.047	400	23062280	P488N-1	DF-104	CUB4P1		PT401	4TM-P1	
C75	.015	600	23008640							
C76	.047	400	23062440							
C77	1500	1000	23064640	HVD-15-1500	DD-152	VD15	1R5KV-152	DC30215	10GA-D15	
C78	82	500	23003810	1468-000082	D6-820	5R5Q82	801-820		MS-482	
C79	82	500	23003810	1468-000082	D6-820	5R5Q82	801-820		MS-482	
C80	.047	400	23062240							
C81	.047	200	23062440							
C82	.022	400	23062200	BPD-03	DF-303	CUB4S22	817-03	PT4123	4TM-S23	
C83	.47	200	27007840	P288N-47		CUB5P47			2TM-P47	
C84	100	500	27003190	1468-00018	D6-181	5R5T18	811-181		MS-418	
C85	.01	300	27014160							
C86	.047	500	27017780	1494-0025		1R5D13	811-123		MS-312	
C87	1000		23002240	811000	D6-102	TP53	GP2L-102	UC-531	5HK-D1	Note 4
C88	.1	400	23011780	P488N-1	DF-104	CUB4P1		PT401	4TM-P1	
C89	.01	400								Note 5
C90	.047	300		BPD-05	DF-503	CUB5S247		PT4147	5TM-S47	Note 6
C91	.47	3000		HVD-30-47	DD30-470	VD4Y	3KV-470	DC30447	30GA-Q6	Note 7
C92	5000	1000	23066480	HVD-15-5000	DD-502	VD47	1R5KV-472		20HK-D47	
C93	1500	1000	23066640	HVD-15-1500	DD-152	VD15	1R5KV-152	DC30215	10GA-D15	
C94	1500	1000	23066640	HVD-15-1500	DD-152	VD15	1R5KV-152	DC30215	10GA-D15	
C95	1500	1000	23066640	HVD-15-1500	DD-152	VD15	1R5KV-152	DC30215	10GA-D15	
C96	1500	1000	23066640	HVD-15-1500	DD-152	VD15	1R5KV-152	DC30215	10GA-D15	
C97	1000	1000	23066640	HVD-15-1500	DD-153	VD15	1R5KV-153	DC30215	10GA-D15	
C98	1500	1000	23066640	HVD-15-1500	DD-152	VD15	1R5KV-152	DC30215	10GA-D15	
C99	1500	1000	23066640	HVD-15-1500	DD-152	VD15	1R5KV-152	DC30215	10GA-D15	
C100	.01	600	23017860	BPD-01	DD-103	CUB5S1	811-01	DC-511	5TM-S1	
C101	1500	1400	23067010	HVD-15-1500		VD15	1R5KV-152	DC30215		
C102	1500	1000	23067010	HVD-15-1500		VD15	1R5KV-153	DC30215		

Note 2. Some versions use .27MFD, 20%, in this application (part #2201L330).
Note 3. Not used in some versions.
Note 4. Channels 1804, 1805 and 1808 use 470MFD in this application (part #23002200).
Note 5. Some versions use .27MFD, 10%, in this application (part #23006330).
Note 6. Some versions use 1MFD in this application (part #23012390).
Note 7. Some versions use 56MMF in this application.

CONTROLS

ITEM No.	RATING: RESISTANCE	WATTS	REPLACEMENT DATA: CBS-Columbia PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1MΩ	½	36001371	F2-3		QJ-784 ✦	UF13R	Contrast (Panel) See Note 1
B	350KΩ	½		R3-41			UR354A	Volume (Rear)
C	Switch					KN-1	US-38	Attach to R1B.
R2A	100KΩ	½	36001381	F1-31	RTV-524	QJ-783 ✦	UF13L	Horizontal Hold (Panel) See Note 2
B	200KΩ	½		R2-32			UR354L	Vertical Hold (Rear)
R3A	5Meg	½	36001291	AB-97	A47-5Meg-S	Q11-141	TA5EL	Height
B	Shaft		Not Req.	AK-4	R5-2	Not Req.	Not Req.	Attach to R3A.
R4A	250KΩ	½	36001301	AB-80	A47-250K-S	Q11-135	TA3541	Brightness
B	Shaft		Not Req.	AK-4	R2-2	Not Req.	Not Req.	Attach to R4A.
R5	600Ω	2	36001851		35-600			AM Rejection (Wire Wound)
R6	4000Ω	2	36001281		35-3000-700			Vertical Linearity (Wire Wound) Stop at 1000Ω

Note 1. Part No. 36001421 used as an alternate in chassis 1603, 1804, 1807, and 1808.
Note 2. Part No. 36001431 used as an alternate in chassis 1603, 1804, 1807, and 1808.
† Universal Replacement (Mallory Exact Duplicate Part No. US 1183).
✦ Concentrikit Equivalent; K-2 Kit, Base Elements and Shafts; B11-105, P1-102 (Panel) B13-132, R2-17 (Rear)
76-1 (Switch)
✦ Concentrikit Equivalent; K-3 Kit, Base Elements and Shafts, B11-125, P1-102 (Panel) B11-126, R2-17 (Rear)
✦✦ Universal Replacement (Mallory Exact Duplicate Part No. US-34)

RESISTORS

ITEM No.	RATING: OHMS	WATT	REPLACEMENT DATA: CBS-Columbia PART No.	IRC PART No.	NOTES
R7	470KΩ	½		BTS-470K	
R8	470KΩ	½		BTS-470K	
R9	15KΩ	½		BTS-15K	
R10	47KΩ	½		BTS-47K	
R11	12KΩ	½		BTS-12K	
R12	220Ω	½		BTS-220	
R13	220KΩ	½			
R14	100KΩ	½			
R15	100KΩ	½			
R16	100KΩ	½			
R17	330Ω	½			
R18	10MΩ	½			
R19	5000Ω	½	29W7-5000		
R20	270KΩ	½	30274230	BTS-270K	
R21	3.3Meg	½	30395530	BTS-3.3Meg	Note 1
R22	100KΩ	½	30102330	BTS-1000	
R23	27KΩ	½	30273230	BTS-27K	
R24	330Ω	½	30331330	BTS-330	
R25	330Ω	½	30331330	BTS-330	
R26	47Ω	½	30470230	BTS-47	
R27	56KΩ	½	30563230		
R28	100KΩ	½	30102330	BTS-1000	
R29	330Ω	½	30331330	BTS-330	
R30	47Ω	½	30470230	BTS-47	
R31	56KΩ	½	30563230		
R32	5600Ω	½	30562240		

ITEM No.	RATING: OHMS	WATT	REPLACEMENT DATA: CBS-Columbia PART No.	IRC PART No.	NOTES
R33	100KΩ	½	30102330	BTS-1000	
R34	100Ω	½	30101230	BTS-100	
R35	100KΩ	½	30102330	BTS-1000	
R36	12KΩ	½	30123230	BTS-12K	Note 2
R37	470Ω	½	30472230	BTS-470	
R38	100KΩ	½	30102330	BTS-100K	
R39	82KΩ	½	30823230	BTS-82K	
R40	1Meg	½	30105330	BTS-1Meg	
R41	1Meg	½	30105230	BTS-1Meg	
R42	1Meg	½	30105230	BTS-1Meg	
R43	6800Ω	½	30123230	BTS-6800	Note 3
R44	6800Ω	½	30006531	PWH-6800	Note 4
R45	27KΩ	1	30273240	BTA-27K	
R46	47Ω	1	30470230	BTS-47	
R47	22KΩ	½	30223230	BTS-22K	
R48	150KΩ	½	30154230	BTS-150K	
R49	100KΩ	½	30102230	BTS-1000	
R50	100KΩ	½	30104230	BTS-100K	
R51	10KΩ	2	30103290	BTS-10K	
R52	12KΩ	½	30123230	BTS-12K	
R53	120Ω	½	30121330	BTS-120	
R54	1000Ω	½	30102230	BTS-1000	
R55	3900Ω	½	30392340	BTA-3900	
R56	22KΩ	½	30223330	BTS-22K	
R57	1Meg	½	30105230	BTS-1Meg	
R58	1Meg	½	30105230	BTS-1Meg	

RESISTORS (cont)

ITEM No.	RATING: OHMS	WATT	REPLACEMENT DATA: CBS-Columbia PART No.	IRC PART No.	NOTES
R59	1000Ω	½	30102330	BTS-1000	
R60	5.6Meg	½	30565230	BTS-5.6Meg	
R61	330KΩ	½	30333230	BTS-330K	
R62	330KΩ	½	30334230	BTS-330K	
R63	2.2Meg	½	30225230	BTS-2.2Meg	
R64	82KΩ	½	30823230	BTS-82K	
R65	150KΩ	½	30154230	BTS-150K	
R66	330KΩ	½	30334230	BTS-330K	
R67	10KΩ	½	30103230	BTS-10K	Note 1
R68	2500Ω	½	30252230	BTS-2500	Note 1
R69	150Ω	½	30472340	BTA-4700	Note 5
R70	1000Ω	½	30102230	BTS-1000	Note 6
R71	22KΩ	½	30223330	BTS-22K	
R72	6300Ω	½	30823230	BTS-8300	
R73	6300Ω	½	30823230	BTS-8300	
R74	470KΩ	½	30104230	BTS-470K	
R75	330KΩ	½	30334230	BTS-330K	
R76	100KΩ	½	30004230	BTS-1000K	
R77	3.9Meg	½	30395230	BTS-3.9Meg	Note 7
R78	100KΩ	½	30104230	BTS-100K	
R79	2.2Meg	½	30225230	BTS-2.2Meg	
R80	22KΩ	½	30223230	BTS-22K	
R81	2500Ω	½	30252230	BTS-2500	Note 8
R82	470Ω	½			Note 9
R83	470Ω	½			Note 9

ITEM No.	RATING: OHMS	WATT	REPLACEMENT DATA: CBS-Columbia PART No.	IRC PART No.	NOTES
R84	230KΩ	½	34234230		
R85	230KΩ	½	34234330		
R86	680KΩ	½	34684330		
R87	100KΩ	½	34104230		Note 10
R88	22KΩ	½	34223230		Note 1
R89	82KΩ	½	34823230		
R90	390Ω	½	34392230		
R91	330KΩ	½	34334230		
R92	100KΩ	½	34104230		Note 11
R93	330Ω	½	34332230		
R94	470KΩ	½	34474230		
R95	470KΩ	½	30474230	BTS-470K	Note 7
R96	470KΩ	½	30474230	BTS-470K	Note 12
R97	470KΩ	½	30474230	BTS-470K	Note 13
R98	470KΩ	½	30474230	BTS-470K	Note 13
R99	270KΩ	½	30274230	BTS-270K	Note 1
R100	8200Ω	½	31000471	PWH-8200	
R101	470Ω	½	30004230	BTS-1000K	
R102	56000Ω	½	30562230	BTS-5600	
R103	2.7Ω	5	31000980	PW5-2.7	Note 13
R104	220KΩ	½	30224340	BTA-220K	
R105	220Ω	5	31000497		Note 1, 14
R106	4Ω	25			Note 15
R107	7.5Ω	6	31000472		

Note 1 Not used in some versions.
Note 2. Some versions use no 180KΩ ½W resistor in this application.
Note 3 Some versions use a 12KΩ ½W or an 18KΩ ½W resistor in this application.
Note 4. Some versions use 2 10KΩ 2W resistors in parallel in this application.
Note 5. Some versions use a 180Ω 1W resistor in this application.
Note 6. Some versions use a 2.2KΩ ½W resistor in this application.
Note 7. Some versions use a 10Meg ½W resistor in this application.
In chassis 1606 a 10Meg ½W resistor in parallel with a 5.6Meg ½W resistor is used in this application.
In chassis 1804, 1808, a 10Meg ½W resistor in parallel with two 5.6Meg ½ resistors wired in parallel.
Note 8. In chassis 1605, 1606 a 680Ω 1W resistor is used in this application.
Note 9. Some versions use a 330Ω ½W resistor in this application.
Note 10. Some versions use a 68KΩ ½W resistor in this application.
Note 11. Some versions use a 150KΩ ½W resistor in this application.
Note 12. Some versions use a 270KΩ ½W resistor in this application.
Note 13. Some versions use a 3.9Ω ½W (WW) resistor in this application when V15 is a 1X2B.
Note 14. Some versions use a 470Ω 2W resistor in this application.
Note 15. Some versions use a 46Ω 25W resistor in this application.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA: CBS-Columbia PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	Horiz. Output Trans.	12001091 12001051 ① 12001151 ②	FB447			SX-01 * SX-01 * SX-01 *			
T2	Vert. Output Trans.	[redacted]	21900 2	A-2824 4		V313 5	A-8123 4	26852 5	A-09X 3
T3A	Yoke-Horiz. (24MH)	18001091 ③	DF605 7	MDP-75 7	222D1 7	T70P25 7	DY-15A 7	Y-10 7	Y-19-1 7
B	Vert.(42MH)	18001351 ④	DF605 8	MDP-75 8	222D1 8	T70P25 8	DY-15A 8	Y-10 8	Y-19-1 8

1 Alternate CBS Columbia Part No.
2 Use 15 to 1 turns ratio.
3 Connect as auto trans.
4 Drill new mounting hole(s).
5 Cut & tape yellow lead.
6 Includes capacitor C91, resistors R63, R83, & R101.
7 Use original rear cover & centering device.
8 Connect horiz. damping network across terms #3 & #7.
9 Use original yoke damping network if necessary.
* Available on special order only.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	SEC.	CBS Columbia PART No.	REPLACEMENT DATA: Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T4	2.2KΩ	3.4Ω	Part of speaker 23000801		A2928	A3876		S-1X	

SPEAKER

ITEM No.	RATINGS: SIZE	FIELD	V C. IMP	REPLACEMENT DATA: CBS Columbia PART No.	QUAM PART No	RCA TYPE No	NOTES
SP1	5"	PM	3.4Ω	23000801	5A07	20S52	① Used in Models 22TK301, 22TK321, 23TK301,
	5"	PM	3.4Ω	23000523 ②	5A07	20S52	23TK302, 23TK303, 23TK304, 23TS005, 23TS006,
	5"	PM	3.4Ω	23000741 ③	5A07	20S52	U22TK301; U22TK321 U.23TK301, U23TK302,
	5"	PM	3.4Ω	23000735 ④	5A07	20S52	U23TK303, U23TK304, U23TS005, U23TS006.
	6"	PM	3.4Ω	23000781 ⑤	6A1	22S61	② Used in Models 23CK009, 23CK010.
	6"	PM	3.4Ω	23000781 ⑤	6A1	22S61	③ Used in Models 23TS007, 23TS008, U23TS007,
	8"	PM	3.4Ω	23000531 ⑥	8A4	23S81	U23TS008.
							④ Used in Models 23CS013, 23CS014, U23CS013, U23CS014.
							⑤ Used in Models 23CK011, 23CK012.

COILS (RF-IF)

ITEM No.	USE	DC RES.: PRI.	SEC	REPLACEMENT DATA: CBS-Columbia PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Ant. Coils	00CT	0Ω					
L2	RF Mixer Grid Osc. Coils	0Ω						
L3	Pix. Choke	0Ω						
L4	Conv. Plate	.1Ω	.1Ω					
L5	1st Video IF	0Ω	.1Ω	13001031	17-5003 ✦	TV-137 ✦	6332 ✦	
L6	Pix. Choke	0Ω		13-1001	15000851		4604	L 5 Microhenries
L7	2nd Video IF	.1Ω	.1Ω	13001131	15-1001		4604	Includes 4L 25MC Trap
L8	Pix. Choke	0Ω		13-1001	15000851		4604	L 5 Microhenries
L9	3rd Video IF	.1Ω	.1Ω	13001031	17-5014 ✦			Includes 180MMF Cap.
L10A	4th Video IF	.1Ω	.1Ω					
B	2nd Sound IF	1.1Ω		12001041				
L11	1st Sound IF	.8Ω		15000671				
L12	Series Peaking Coil			16001481	19-1005		4613	✦ Microhenries not used in some versions.

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: CBS-Columbia PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L13	Series Peaking Coil	12Ω		16001364	19-3250	TV-185	6181	236 Microhenries
L14	Shunt Peaking Coil	17Ω		16000045	19-3500		6174	500 Microhenries
L15	Series Peaking Coil	8.2Ω		15000701	19-1005		4612	10 Microhenries, IRC Part No. CL-1
L16	4.5MC Trap	3.2Ω		16001401	20-1004	TV-151	1469	
L17	Series Peaking Coil	12Ω		16001364	19-3250	TV-185	6181	236 Microhenries
L18	Shunt Peaking Coil	18Ω		16000045	19-3500		6174	530 Microhenries
L19	3rd Sound IF	3.3Ω	3.3Ω	12001151				
L20	Quadrature Coil	3.8Ω		15000721	17-1031 ▲	TV-113 ▲	1481	

* Detune trap
■ Add 180MMF Cap. externally.
▲ Cut out chassis hole & drill mounting holes.
▲ Use one winding only.

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: CBS-Columbia PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	RCA TYPE No.	Ram PART No.	Thordarson PART No.	NOTES
L21	22Ω	55Ω	15000681	20-1402 ♦	TV-162 ♦	6183 ♦	205R1	H-100	HS-3	Waveform Winding 47Ω

♦ Reverse coil mounting in can.

FILTER CHOKE

ITEM No.	RATINGS: TOTAL DIRECT CURRENT	RATINGS: D.C. RESISTANCE	RATINGS: INDUCTANCE (0 CURRENT 1000 ∿)	REPLACEMENT DATA: CBS-Columbia PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L22	.200A	48.5Ω	.9HY	Part of speaker 73000801	C5040	C2994	C2327	26C41	C-23X ①

① Drill one new mounting hole.

SELENIUM RECTIFIER

ITEM No.	RATING: CURRENT	REPLACEMENT DATA: CBS-Columbia PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	NOTES
M1	.200ADC	62000061	1236A	MR300	6S300	6Q4	300	
M2	.200ADC	62000061	1236A	MR300	6S300	6Q4	300	

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA: CBS-Columbia PART No. FUSE	CBS-Columbia PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M3	3AG S/B P/T	1 1/4A 125V	43000070		3151.25 (3AG S/B P/T 1 1/4 A)		MDV1 1/4	

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA: CBS-Columbia PART No.	REPLACEMENT DATA: SYLVANIA PART No.	NOTES
M4	1N64 *	63000091	1N60	Video Det. (Pigtail)

* Some versions may use crystal diode type 1N60 in this application.

MISCELLANEOUS

ITEM No.	PART NAME	CBS-Columbia PART No.	NOTES
M5	Tuner	69000631	VHF-Chassis 1603, 1605, 1607
	Tuner	69000641	VHF-Used in some versions of chassis 1603 only.
	Tuner	69000691	VHF-Chassis 1604
	Tuner	69000692	VHF-Chassis 1606, 1608
M6	Tuner	69000701	UHF-Chassis 1604, 1606, 1608
M7	Trap	83A64917	VHF Ant. Input Filter, Used with all VHF tuners except tuner Part No. 69000641
M8	Switch	40000321	Local-Distance (SP-3 Position, Rotary-Wafer Type)
M9	Centering Device		Part of deflection yoke (T3) Rear Cover
M10	Ion Trap	19000081	
M11	Magnet	19000241	Anti-Barkhausen-Chassis 1604, 1606, 1608
B3	Trimmer Cap.	25000011	Horiz. Drive (25-250MMF)
	Safety Glass	77000357	Models 22TK301, U22TK301
	Safety Glass	77000432	Models 22TK321, 22CK009, 22CK010, U22TK321,
	Safety Glass	77000433	Models 23TK001, 23TK002, 23TK003, 23TK004, 23TS005, 23TS006, 23TS007, 23TS008, 23CK011, 23CK012, 23CS013, 23CS014, U23TK001, U23TK002, U23TK003, U23TK004, U23TS005, U23TS006, U23TS007, U23TS008, U23CS013, U23CS014
	Mask	71001411	Models 22TK301, 22TK321, 22CK009, 22CK010,
	Mask	71001481	Models 23TK001, 23TK002, 23TK003, 23TK004, 23CK011, 23CK012, U23TK001, U23TK002, U23TK003, U23TK004
	Mask	71001571	Models 23TS005, 23TS006, 23TS007, 23TS008, 23CS013, 23CS014, U23TS005, U23TS006, U23TS007, U23TS008, U23CS013, U23CS014
	Mask	04005641	Models U22TK301, U22TK321

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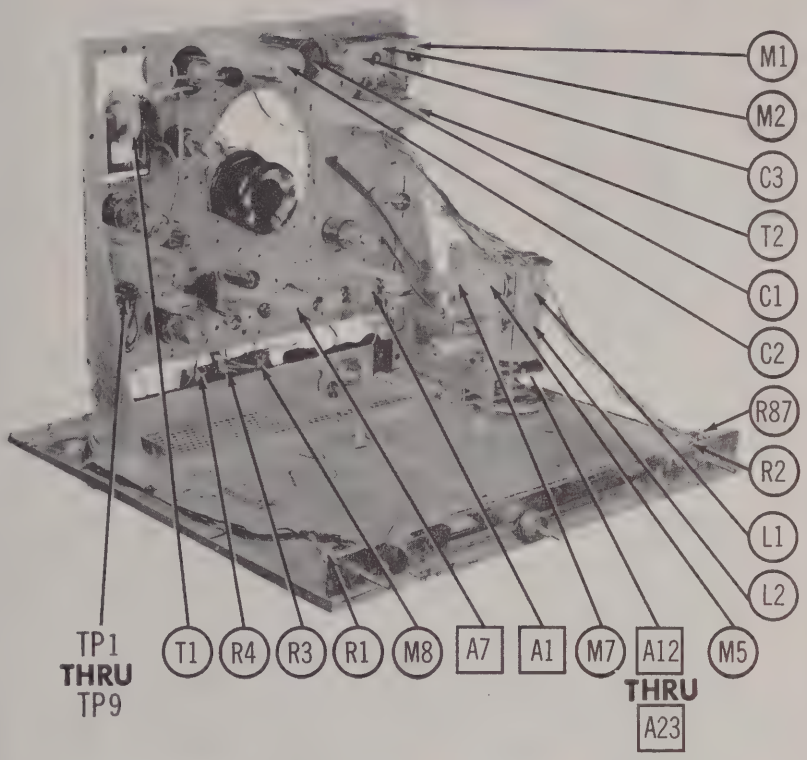
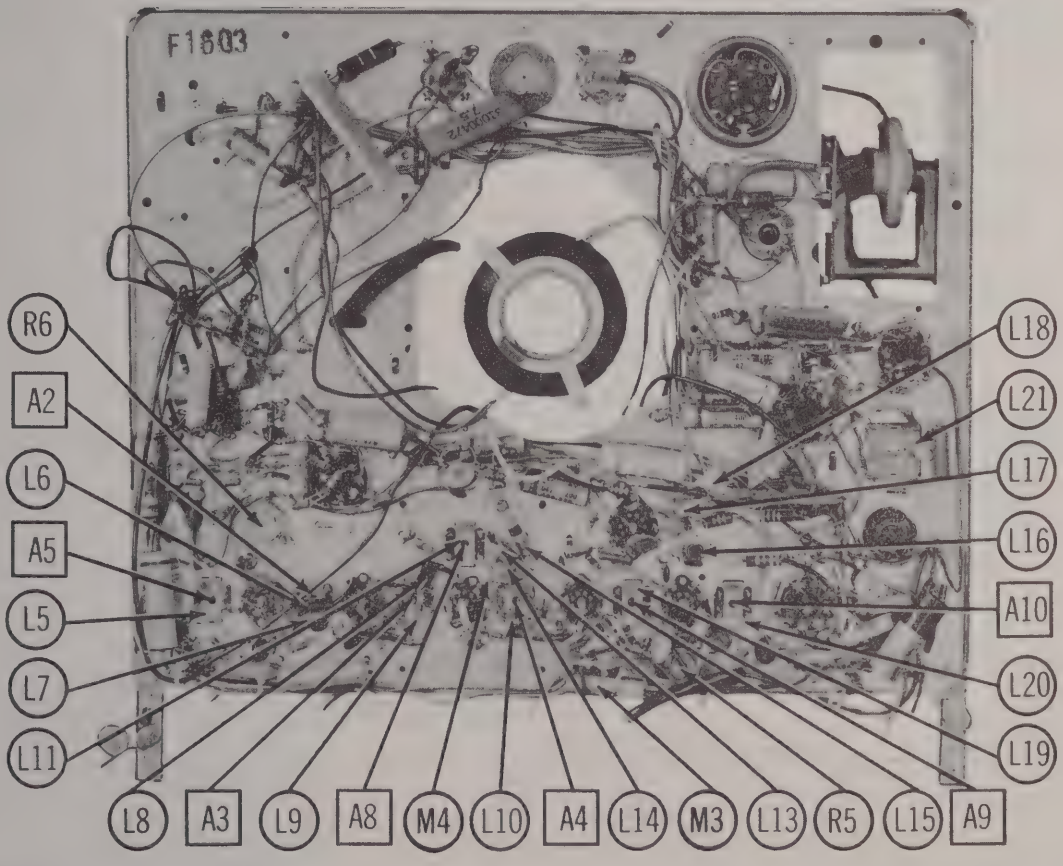
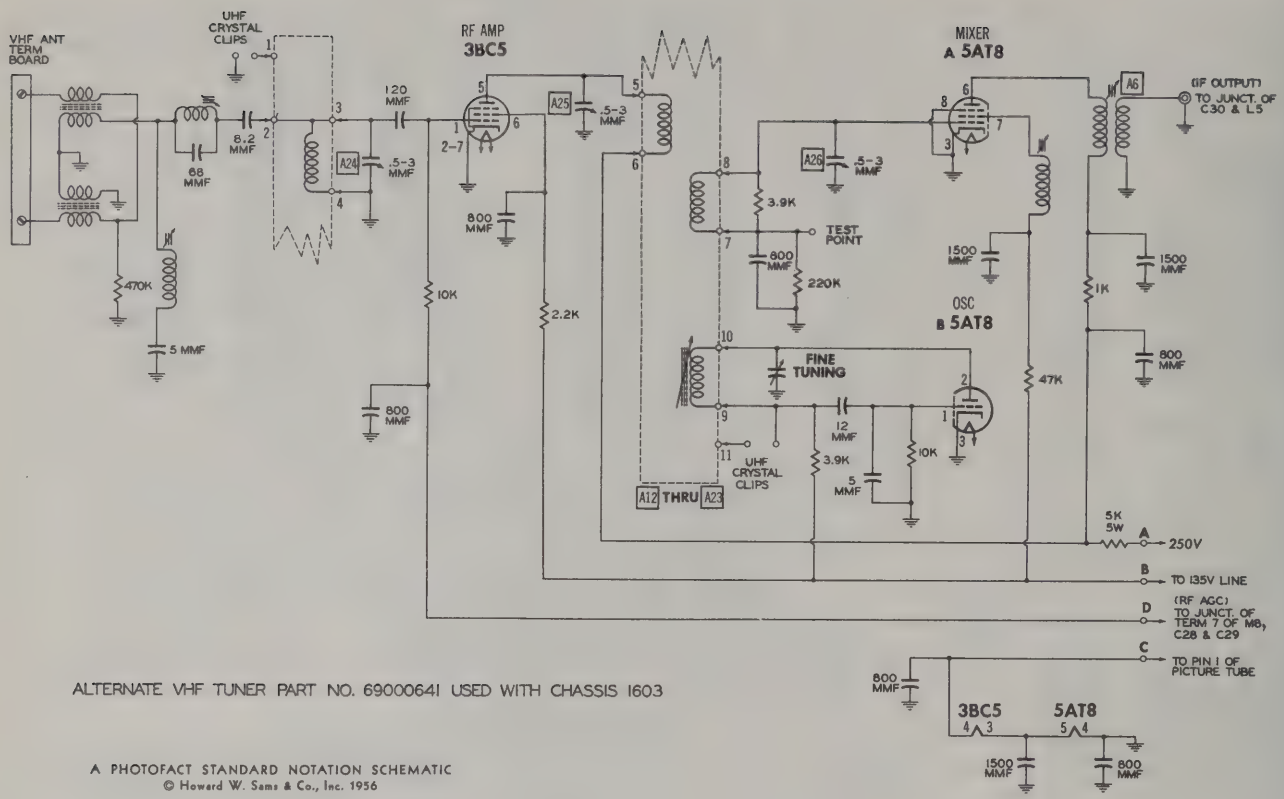
SOCKET PIN NO.	
TP1 2	117V LINE VOLTAGE
TP2 4	117V LINE VOLTAGE
TP3 5	-.2V IF AGC
TP4 6	230V PLATE VOLTAGE PIN #3 V9
TP5 7	115V VOLTAGE DIVIDER BIAS VOLTAGE PIN #5 V9
TP6 8	-.2V DET. OUTPUT
TP7 9	260V RECT. B+ OUTPUT
TP8 10	-10V VOLTAGE DIVIDER TUNER AGC
TP9 11	250V HIGH B+ SUPPLY



CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW INDUCTOR AND ALIGNMENT IDENTIFICATION



ALTERNATE VHF TUNER PART NO. 6900064I USED WITH CHASSIS 1603

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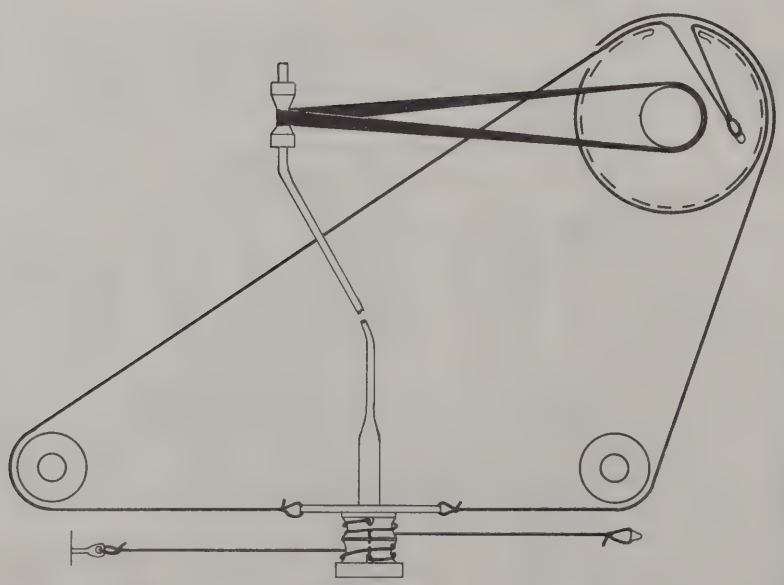
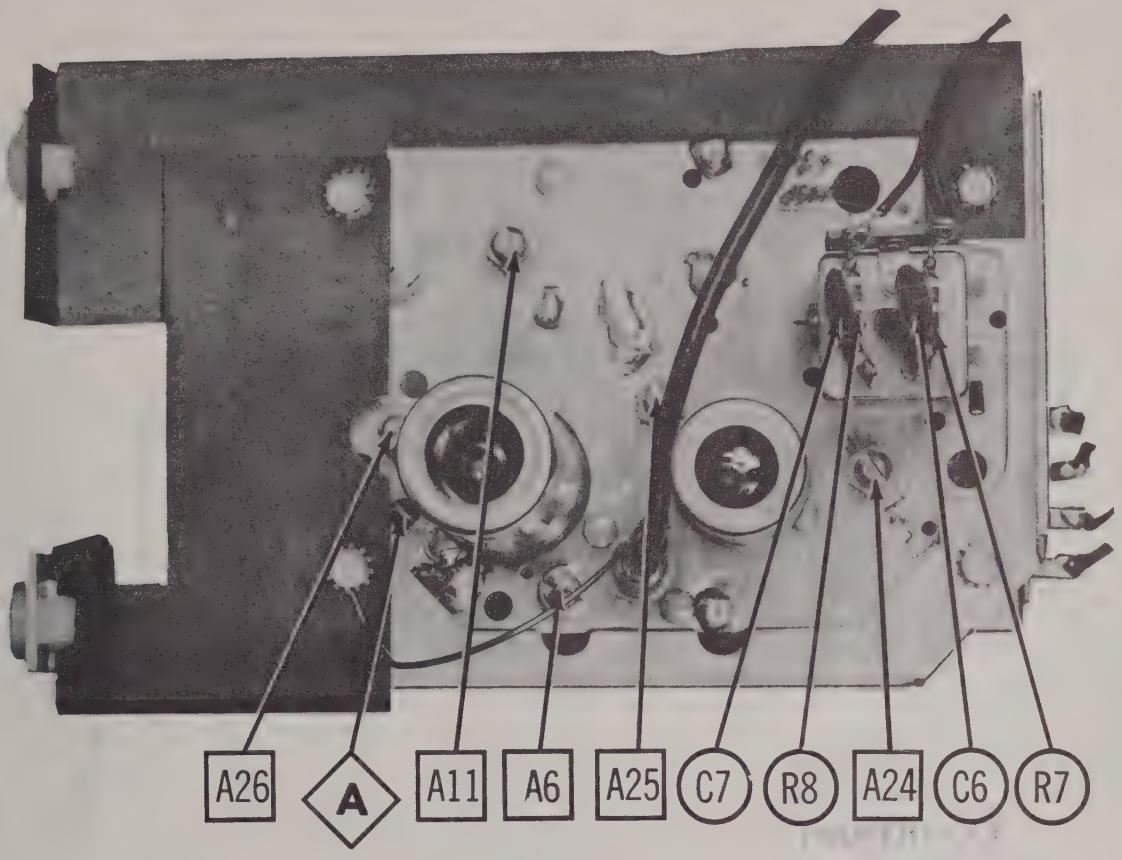
ALTERNATE VHF TUNER SCHEMATIC



SHOWN IN CHANNEL #7 POSITION

DRIVE CORD STRINGING



RF TUNER-TOP VIEW

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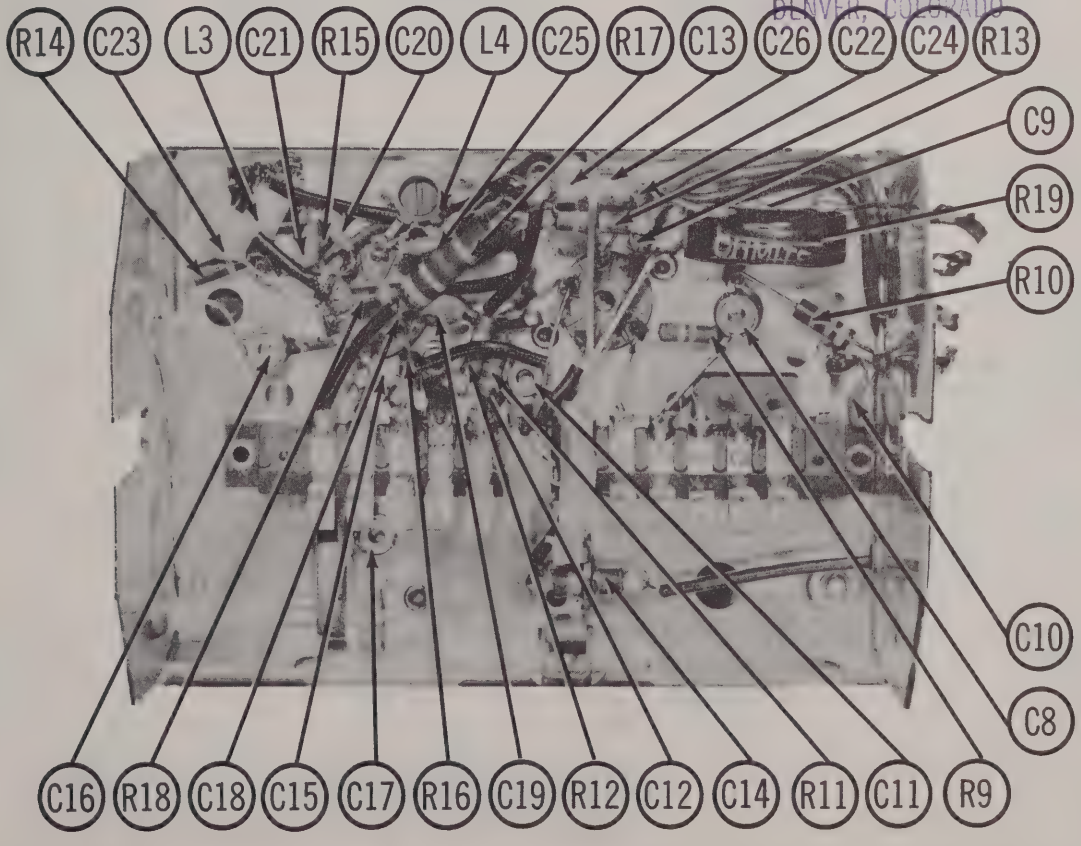
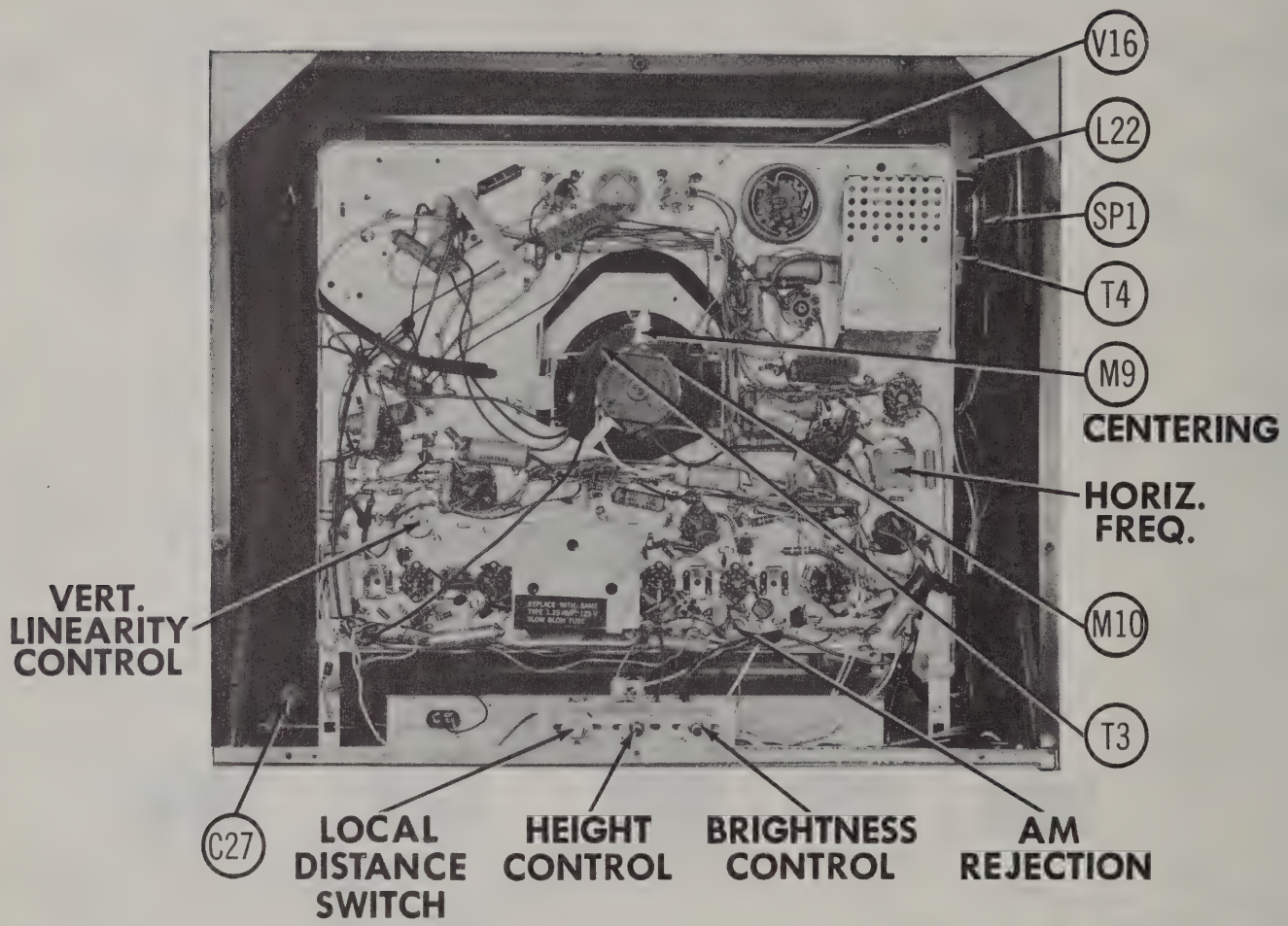


RF TUNER-BOTTOM VIEW



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

1. Tune the receiver to a TV station, and adjust controls for normal picture and sound. Set the horizontal hold control in the center of its range.

2. Short terminals "C" and "D" of the horizontal oscillator coil (L21) and adjust the horizontal frequency slug (B1) until picture is in sync. Set the slug at the center of the range in which the picture remains in sync.

3. Remove short and connect a scope to terminal "C" of L21 thru a 10 MMF capacitor. Low side to chassis.

4. Adjust horizontal waveform (B2) for waveform shown in Fig. 3. The rounded peak and the sharp peak must be the same amplitude.

5. Adjust B1 so that picture just begins to fall out of sync with the horizontal hold control fully clockwise.

Using an insulated screwdriver, turn the horizontal drive control (B3) counter clockwise until a bright vertical line appears in the picture, then turn the control clockwise until the line just disappears.

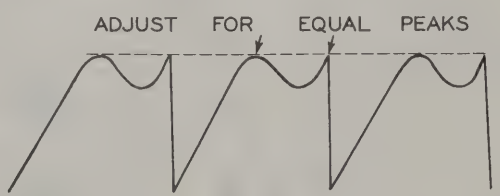


FIG. 3

PHOTOFACT* Folder
*TRADE MARK

FIRESTONE MODELS 13-G-170, 13-G-171, 13-G-174, 13-G-175 (Codes 334-4-AM54A, 334-4-AM58A, 334-4-AS58A)

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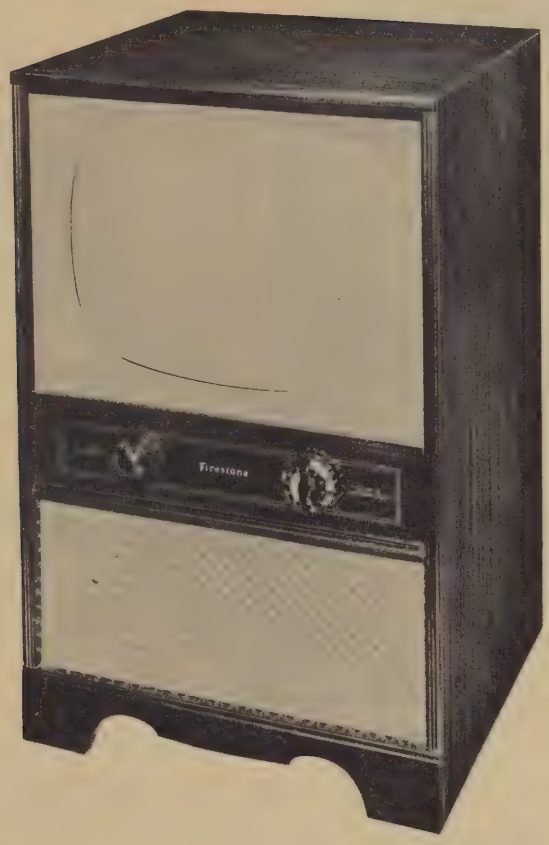

FIRESTONE MODELS 13-G-170, 13-G-171, 13-G-174, 13-G-175 (Codes 334-4-AM54A, 334-4-AM58A, 334-4-AS58A)

FIRESTONE MODEL 13-G-174 (Code 334-4-AM54A)

TRADE NAME	Firestone Models 13-G-170, 13-G-171, 13-G-174, 13-G-175 (Code 334-4-AM54A, 334-4-AM58A, 334-4-AS58A)
SUPPLIER	Firestone Tire & Rubber Co., 1200 Firestone Pkwy., Akron, Ohio
TYPE SET	Television Receiver
TUBES	Twenty-one
POWER SUPPLY	110-120 Volts AC-60 Cycles — RATING 1.4 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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PHOTOFACT* Folder
*TRADE MARK

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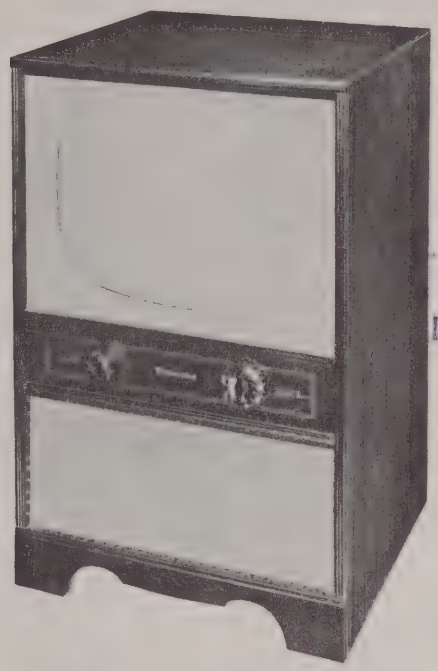

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MODELS	CODE
13-G-170, 13-G-171, 13-G-174, 13-G-175	334-4-AM54A, 334-4-AM58A, 334-4-AS58A

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 4 push-on type control knobs and fine tuning lever from front panel of cabinet.

2. Remove 2 metal screws and 2 wood screws. Remove rear cover.

3. Loosen 4 wood screws. Remove antenna terminal bracket.

4. Disconnect speaker leads.

5. Remove 5 chassis bolts. Remove chassis.

6. Remove 4 speaker nuts. Remove speaker.

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustment of the VHF tuner oscillator circuit may be accomplished as follows:

1. Set the selector knob to VHF position.
2. Tune in a TV station and set the fine tuning control to the center of its range.
3. Remove the channel selector and fine tuning knobs.
4. Adjustments are accessible one at a time thru the small hole above and slightly to the left of the channel switch shaft.

To adjust the UHF oscillator, set the channel selector knobs to the desired UHF channel. The fine tuning knob should be at the center of its range. Remove knobs and adjust the oscillator slug, thru the same hole as for VHF adjustments.
If two UHF channels are received and use the same UHF coil strips, the oscillator should be set for the channel closest to the center of the group.

PICTURE TUBE SAFETY GLASS CLEANING

To clean safety glass remove 5 wood screws holding plastic strip at the top of the safety glass. Remove plastic strip and safety glass. Use extreme caution when removing safety glass.

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION

See tube placement chart on page 5.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjustment of the horizontal oscillator (L32) can be made from rear panel of chassis. L32 is used as the horizontal hold control. Adjust L32 until picture synchronizes horizontally. Check by switching off channel and back again.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary (A12) located on top of chassis.

FUSES

One fuse is used for LV power supply protection. (For location see tube placement chart).

CENTERING

Centering is accomplished mechanically by means of a centering lever on the PM focusing assembly. Adjust the centering lever from side to side, and up and down until the picture is properly centered.

FIRESTONE MODELS 13-G-170, 13-G-171, 13-G-174, 13-G-175 (Codes 334-4-AM54A, 334-4-AM58A, 334-4-AS58A)

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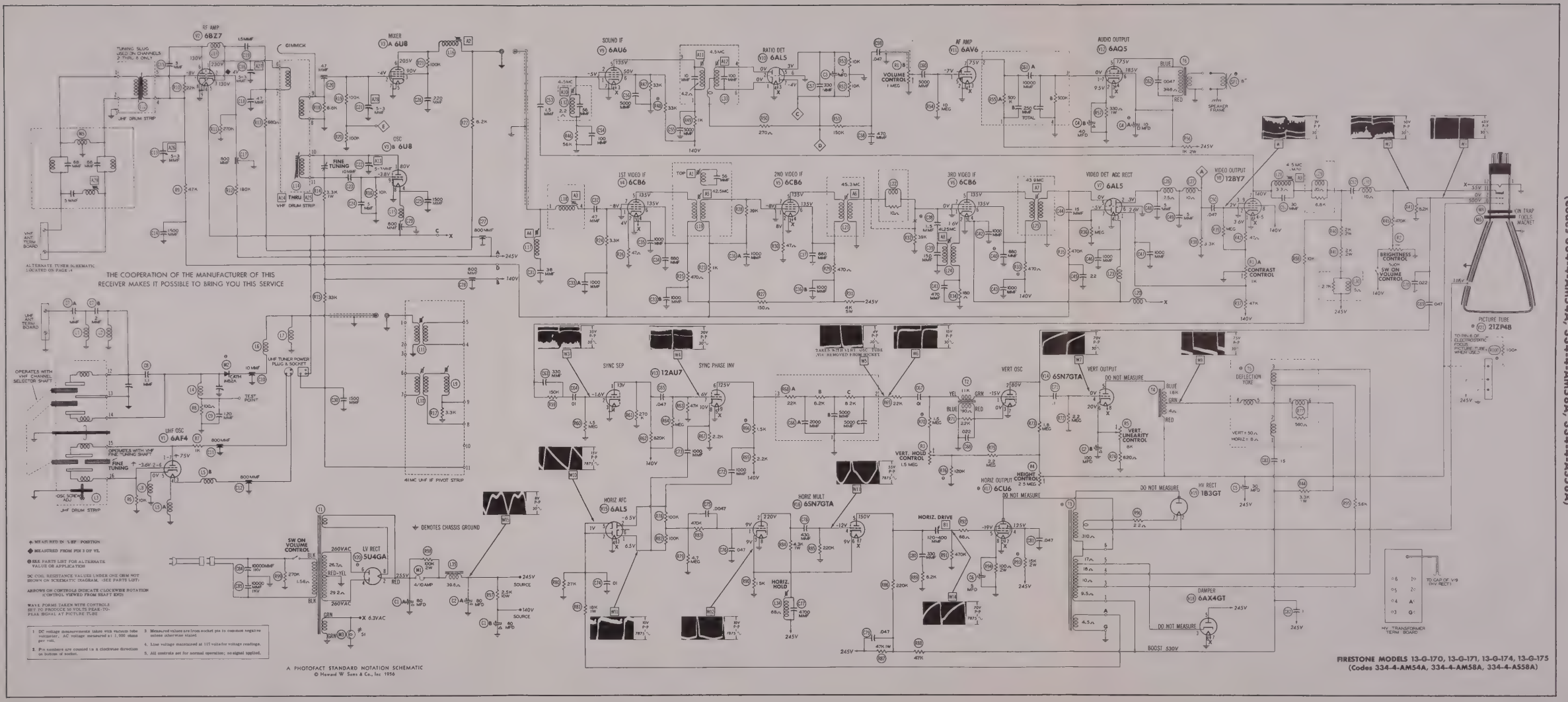
THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
RF AMP V7 6BZ7
MIXER V3A 6U8
OSC V3B 6U8
SOUND IF V9 6AU6
RATIO DET V10 6AL5
AF AMP V11 6AV6
AUDIO OUTPUT V12 6AQ5
VOLUME CONTROL 1 MEG
1ST VIDEO IF V4 6CB6
2ND VIDEO IF V5 6CB6
3RD VIDEO IF V6 6CB6
VIDEO DET AGC RECT V7 6AL5
VIDEO OUTPUT V8 12BY7
CONTRAST CONTROL 1K
BRIGHTNESS CONTROL
SW ON VOLUME CONTROL
PICTURE TUBE V21 21ZP4B
ION TRAP FOCUS MAGNET
DEFLECTION YOKE
VERT. LINEARITY CONTROL 6K
VERT. HOLD CONTROL 1.5 MEG
HEIGHT CONTROL 2.5 MEG
HORIZ. HOLD
HORIZ. DRIVE
HORIZ MULT V18 6SN7GTA
HORIZ AFC V15 6AL5
SYNC SEP
SYNC PHASE INV V13 12AU7
VERT OSC
VERT OUTPUT V14 6SN7GTA
DO NOT MEASURE
HV RECT V19 1B3GT
DAMPER V16 6AX4GT
HORIZ OUTPUT V17 6CU6
BOOST 530V
UHF OSC V1 6AF4
UHF TUNER POWER PLUG & SOCKET
OPERATES WITH VHF CHANNEL SELECTOR SHAFT
OPERATES WITH VHF FINE TUNING SHAFT
FINE TUNING
TEST POINT
OSC SCREW ADJ.
UHF DRUM STRIP
VHF DRUM STRIP
VHF ANT. TERM. BOARD
TUNING SLUG USED IN CHANNELS 7 THRU 6 ONLY
GIMMICK
FINE TUNING
THRU
ALTERNATE TUNER SCHEMATIC LOCATED ON PAGE 4
41.MC UHF IF PIVOT STRIP
SW ON VOLUME CONTROL
LV RECT 5U4GA
260VAC
260VAC
6.3VAC
4/10 AMP
80 MFD
50 MFD
245V SOURCE
140V SOURCE
DENOTES CHASSIS GROUND
TAKEN WITH CRT TUBE V21 REMOVED FROM SOCKET
TO CAP OF V19 (HV RECT)
HV TRANSFORMER TERM BOARD
+ MEASURED IN "LF" POSITION
◆ MEASURED FROM PIN 3 OF V2.
SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION
DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM. (SEE PARTS LIST)
ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)
WAVE FORMS TAKEN WITH CONTROLS SET TO PRODUCE 50 VOLTS PEAK-TO-PEAK SIGNAL AT PICTURE TUBE
1 DC voltage measurements taken with vacuum tube voltmeter. AC voltage measured at 1,000 ohms per volt.
2 Pin numbers are counted in a clockwise direction on bottom of socket.
3 Measured values are from socket pin to common negative unless otherwise stated.
4 Line voltage maintained at 117 volts for voltage readings.
5 All controls set for normal operation; no signal applied.
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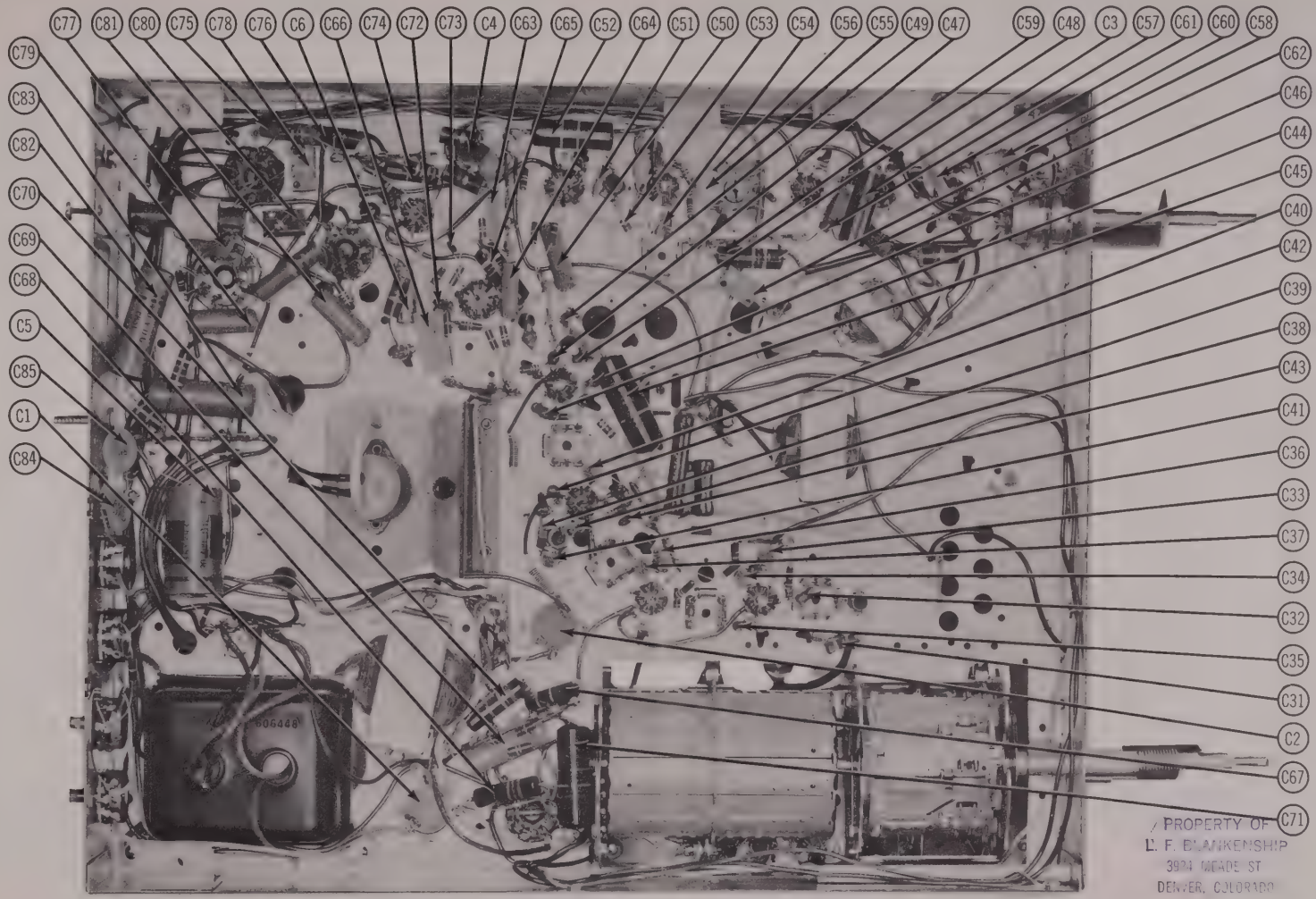
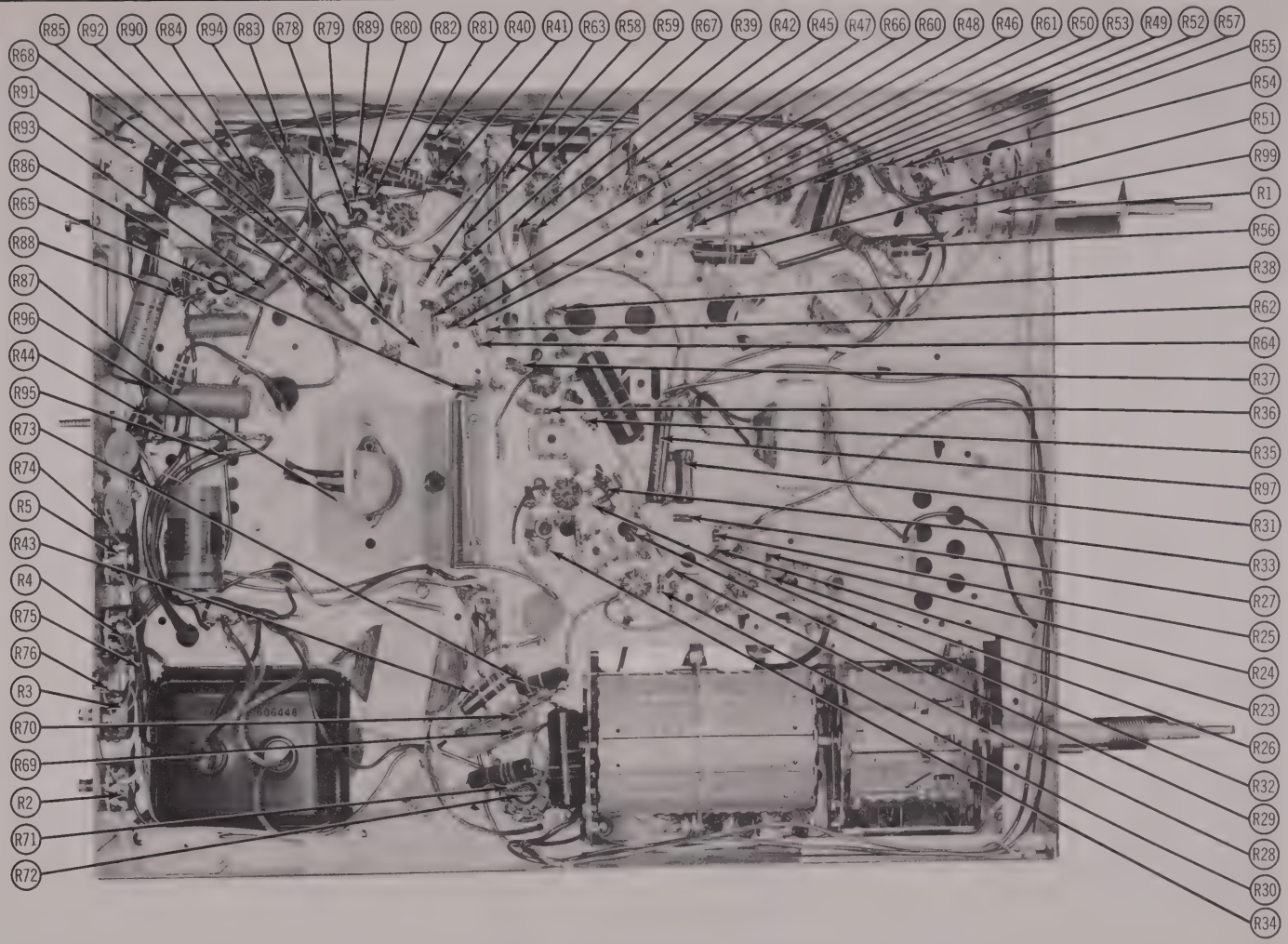
FIRESTONE MODELS 13-G-170, 13-G-171, 13-G-174, 13-G-175
(Codes 334-4-AM54A, 334-4-AM58A, 334-4-AS58A)

FIRESTONE MODELS 13-G-170, 13-G-171, 13-G-174, 13-G-175
(Codes 334-4-AM54A, 334-4-AM58A, 334-4-AS58A)

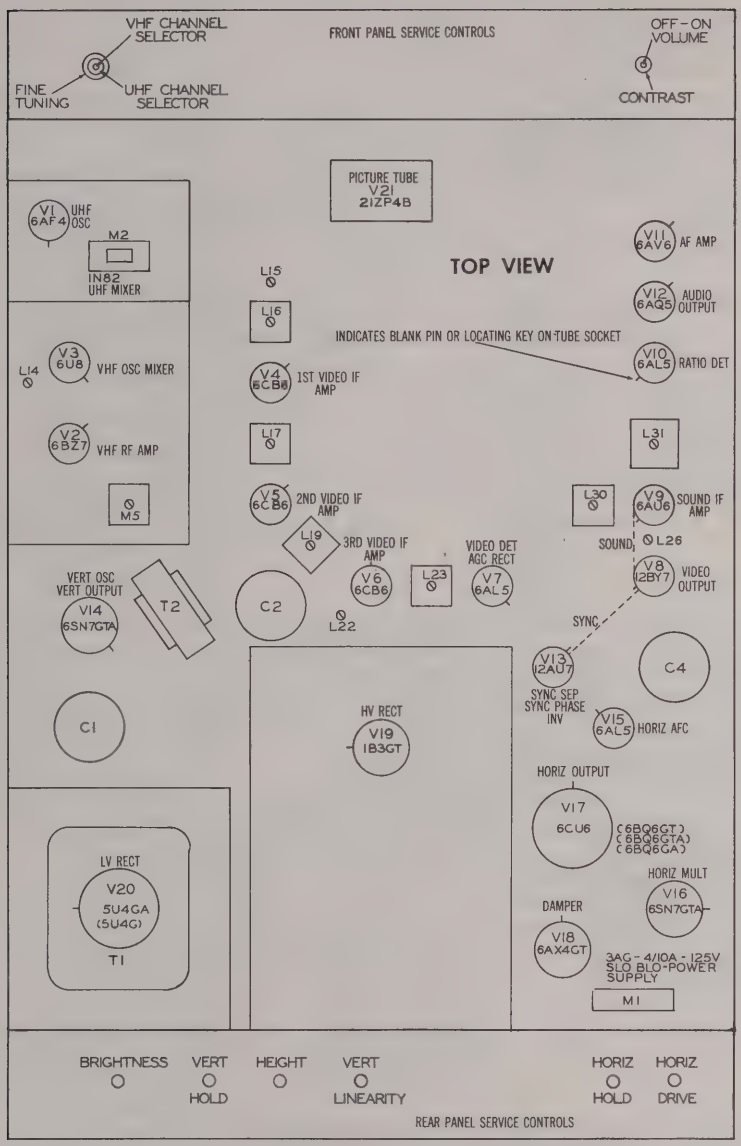


CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

TUBE PLACEMENT CHART



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TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - **V20, Fuse (M1)**

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V3, V4, V5, V6, V7, V8 (V1 UHF only)**
No pic, no sound, has snow - **V2, V3, V4**
No pic, has sound, has raster - **V8, V21**
Has pic, no sound - **V9, V10, V11, V12**

SYNC FAILURE
No vert. sync - **V13, V14**
No horiz. sync - **V13, V15, V16**
No vert. or horiz. sync - **V13**

SWEEP FAILURE
No raster, has sound - **V16, V17, V18, V19, V21**
No vertical deflection - **V14**
Poor vert. linearity or foldover - **V14**
Poor horiz. linearity or foldover - **V16, V17, V18**
Narrow picture - **V16, V17, V18, V19, V20**
Vert. off freq. - **V13, V14**
Horiz. off freq. - **V13, V15, V16**

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage lead should be securely taped and kept away from chassis.

VIDEO IF ALIGNMENT

Connect the negative lead of a 1.5 volt battery to the ungrounded side of C33A. Connect the positive lead to chassis. Remove the VHF RF amplifier (V2) from its socket.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Direct	High side to an ungrounded tube shield floating over converter tube (V3). Low side to chassis.	44MC (10MC Swp.)	41.25MC 45.75MC 47.25MC	Any non-interfering channel	Vert. Amp. thru detector (Fig. 1) to pin 5 (plate) of 1st Video IF Tube (V4). Low side to chassis.	A1, A2, A3, A4	Adjust A1 to place 47.25MC marker in trap notch as in Fig. 2. Adjust A2, A3 and A4 for response similar to Fig. 2. A2 and A3 affect flat portion of the curve. A4 positions the 41.25MC marker. Make sure 45.75MC marker is on peak as shown or the 44.5MC marker on overall response curve (Fig. 3) will be incorrect.
2.	"	"	Not used	42.5MC (Unmod.)	"	Use VTVM DC probe to point Ⓐ. Common to chassis.	A5	Increase bias from 1.5 volts to 4.5 volts at ungrounded side of C33A. Attenuate generator output to maintain 1 volt at VTVM. Adjust for maximum deflection.
3.	"	"	"	45.3MC	"	"	A6	"
4.	"	"	"	43.9MC	"	"	A7	"
5.	"	"	"	41.25MC	"	"	A8	"
6.	"	"	44MC (10MC Swp.)	41.25MC 42.25MC 42.5MC 43.9MC 44.5MC 45.3MC 45.75MC 47.25MC	"	Vert. Amp. thru 10KΩ to point Ⓐ. Low side to chassis.		Check for response curve similar to Fig. 3. SLIGHTLY retouch A5 thru A8 to obtain desired response. If A1 thru A4 requires retouching, step 1 should be repeated.

4.5MC TRAP ALIGNMENT

Set contrast control for maximum.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
7.	10KΩ	High side thru 10KΩ to pin 2 (plate) of 6AL5 (V7). Low side to chassis.	4.5MC (Unmod.)	Any non-interfering channel	DC probe to pin 11 (cathode) of picture tube. Common to chassis.	A9	Adjust for MINIMUM deflection on VTVM.

ALTERNATE 4.5MC TRAP ALIGNMENT

Replace the VHF RF amplifier tube (V2) in its socket. Remove bias supply from ungrounded side of C33A. Tune in a TV station and adjust A9 for MINIMUM 4.5MC beat interference in picture.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Remove the 3rd video IF amplifier tube (V6) from its socket.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
8.	10KΩ	High side thru 10KΩ to pin 2 (plate of 6AL5 (V7). Low side to chassis.	4.5MC (Unmod.)	Any	DC probe to point Ⓑ. Common to chassis.	A10	Adjust for maximum deflection.
9.	"	"	"	"	DC probe to point Ⓒ. Common to chassis.	A11	Use only enough output to provide useable indication at VTVM. Adjust for maximum deflection.
10.	"	"	"	"	DC probe to point Ⓓ. Common to chassis.	A12	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting. Replace V6 in its socket.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Remove the 3rd video IF amplifier tube (V6) from its socket.
Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
8.	10KΩ	High side thru 10KΩ to pin 2 (plate) of 6AL5 (V7). Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any	Vert. Amp. to point Ⓑ. Low side to chassis.	A10	Adjust for curve of maximum amplitude and symmetry similar to Fig. 4.
9.	"	"	"	"	"	Vert. Amp. to point Ⓒ. Low side to chassis.	A11	Disconnect stabilizing capacitor (C3). Adjust for curve of maximum amplitude and symmetry similar to Fig. 4.
10.	"	"	"	"	"	Vert. Amp. to point Ⓓ. Low side to chassis.	A12	Reconnect C3. Adjust so that 4.5MC occurs at center of crossover lines as in Fig. 5. SLIGHTLY retouch A-11 for curve of maximum amplitude and straightness of crossover lines. Replace V6 in its socket.

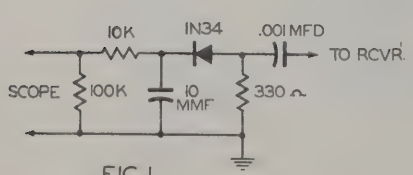

FIG. 1

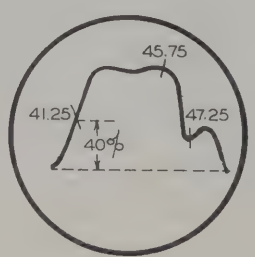

FIG. 2

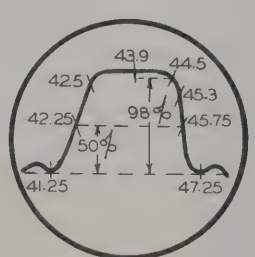

FIG. 3

ALIGNMENT INSTRUCTIONS (cont)

VHF OSCILLATOR ALIGNMENT

Complete oscillator alignment may not be necessary. If the oscillator seems to be off frequency approximately the same amount for a majority of the channels it may be possible to correct them in one step using A13. It should be noted that this is an all channel oscillator circuit adjustment and should not be used to correct any individual channel. If adjustment A13 will not bring all channels well within the range of the fine tuning control it will be necessary to adjust the channel strip adjustment screw for each channel that is off frequency. The channel oscillator adjustment screws are reached through a hole just to the left of the channel switch shaft (hole extends through UHF Tuner).
The correct adjustment screw is accessible through this hole as the channel switch is turned to each channel. Replace VHF RF amplifier (V2) in its socket. Connect the negative lead of a 4.5V bias supply to the ungrounded side of C33A. Connect the positive lead to chassis.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50Ω.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
11.	Two 120Ω Carbon Resistors	Across VHF antenna terminals with 120Ω in each lead.	213MC (10MC Swp.)	211. 25MC 215. 75MC	13	Vert. Amp. thru 10KΩ to point (A). Low side to chassis.	A14	Adjust to place sound marker in trap notch as in Fig. 6. Video marker should be at 50%.
			207MC (10MC Swp.)	205. 25MC 209. 75MC	12		A15	
			201MC (10MC Swp.)	199. 25MC 203. 75MC	11		A16	
			195MC (10MC Swp.)	193. 25MC 197. 75MC	10		A17	
			189MC (10MC Swp.)	187. 25MC 191. 75MC	9		A18	
			183MC (10MC Swp.)	181. 25MC 185. 75MC	8		A19	
			177MC (10MC Swp.)	175. 25MC 179. 75MC	7		A20	
			85MC (10MC Swp.)	83. 25MC 87. 75MC	6		A21	
			79MC (10MC Swp.)	77. 25MC 81. 75MC	5		A22	
			69MC (10MC Swp.)	67. 25MC 71. 75MC	4		A23	
			63MC (10MC Swp.)	61. 25MC 65. 75MC	3		A24	
			57MC (10MC Swp.)	55. 25MC 59. 75MC	2		A25	

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VHF RF AND MIXER ALIGNMENT

Connect the negative lead of a 3 volt bias supply to the ungrounded side of C33A. Positive lead to chassis.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50Ω.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
12.	Two 120Ω Carbon Resistors	Across VHF antenna terminals with 120Ω in each lead.	207MC (10MC Swp.)	205. 25MC 209. 75MC	12	Vert. Amp. to point (E). Low side to chassis.	A26, A27, A28	Adjust for response curve similar to Fig. 7. With markers above 90%.
13.	"	"	213MC (10MC Swp.)	211. 25MC 215. 75MC	13	"		If markers fall below 70% on any channel, make compromise adjustment of A26, A27 and A28 with channel switch set to that channel. Then check all other channels to see that they have not been seriously affected.
			201MC (10MC Swp.)	199. 25MC 203. 75MC	11			
			195MC (10MC Swp.)	193. 25MC 197. 75MC	10			
			189MC (10MC Swp.)	187. 25MC 191. 75MC	9			
			183MC (10MC Swp.)	181. 25MC 185. 75MC	8			
			177MC (10MC Swp.)	175. 25MC 179. 75MC	7			
			85MC (10MC Swp.)	83. 25MC 87. 75MC	6			
			79MC (10MC Swp.)	77. 25MC 81. 75MC	5			
			69MC (10MC Swp.)	67. 25MC 71. 75MC	4			
			63MC (10MC Swp.)	61. 25MC 65. 75MC	3			
			57MC (10MC Swp.)	55. 25MC 59. 75MC	2			

IF WAVE TRAP ADJUSTMENT

The IF wave trap should be tuned to minimize interference caused by signals which fall within the video IF band-pass (40-48MC). Tune in a station on which the interference is noted and adjust A29 for minimum interference in the picture.

UHF OSCILLATOR ALIGNMENT

The UHF oscillator channel strip adjustments are reached through the same hole provided for VHF channel oscillator adjustment screws. Tune in all UHF stations available and check each one to see if the fine tuning control can be tuned through a point where clearest picture and best sound occur. If the fine tuning control does not have sufficient range on any UHF channel strip, set the fine tuning control to its mid-range position and then adjust the UHF channel strip oscillator screw for clearest picture and best sound.

UHF RF ALIGNMENT

The UHF RF portion of this tuner has been properly aligned at the factory and is very stable. Alignment of this portion of the receiver should not be required in the field.

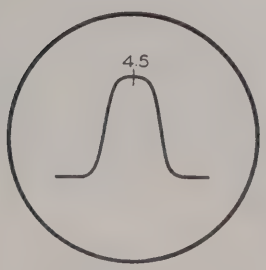


FIG. 4

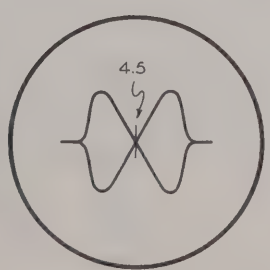


FIG. 5

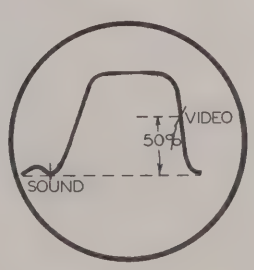


FIG. 6

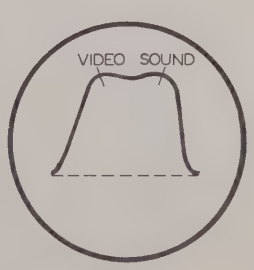
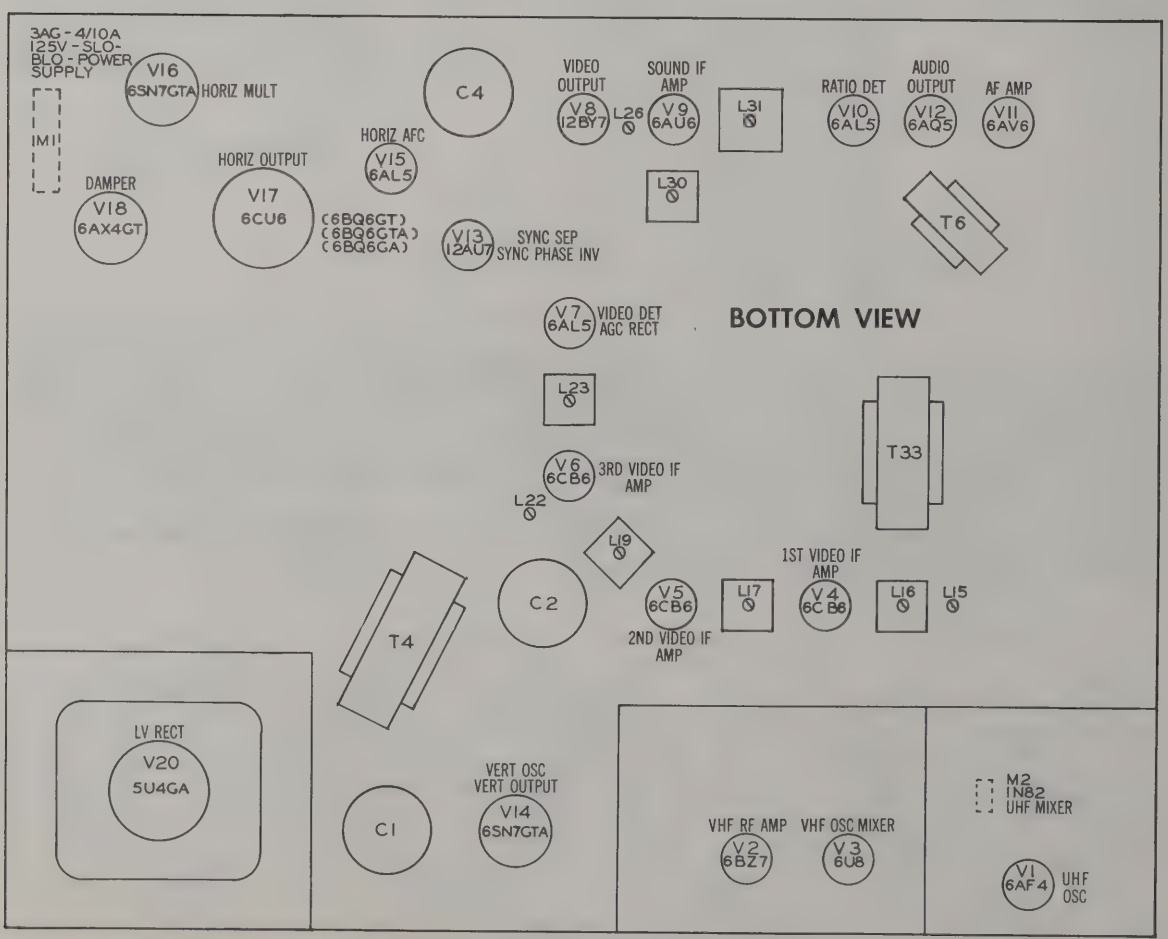


FIG. 7

RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AF4	*† 6.8KΩ	10KΩ	.1Ω	0Ω	0Ω	10KΩ	*† 6.8KΩ		
V 2	6BZ7	† 700Ω	110KΩ	INF	0Ω	.1Ω	INF	1.5Meg	0Ω	0Ω
V 3	6U8	† 5.8KΩ	200KΩ	† 100KΩ	.1Ω	0Ω	† 8.2KΩ	0Ω	0Ω	10KΩ
V 4	6CB6	1.5Meg	47Ω	0Ω	.1Ω	† 4.6KΩ	† 4.6KΩ	0Ω		
V 5	6CB6	1.5Meg	47Ω	0Ω	.1Ω	† 4.5KΩ	† 4.5KΩ	0Ω		
V 6	6CB6	.2Ω	180Ω	0Ω	.1Ω	† 3KΩ	† 3KΩ	0Ω		
V 7	6AL5	900Ω	3.3KΩ	.1Ω	0Ω	.5Ω	0Ω	1Meg		
V 8	12BY7	100Ω	1Meg	0Ω	.1Ω	.1Ω	0Ω	† 4KΩ	† 2.5KΩ	0Ω
V 9	6AU6	56KΩ	0Ω	.1Ω	0Ω	† 3.5KΩ	† 25KΩ	0Ω		
V 10	6AL5	INF	INF	.1Ω	0Ω	10KΩ	0Ω	10KΩ		
V 11	6AV6	10Meg	0Ω	.1Ω	0Ω	NC	NC	† 500KΩ		
V 12	6AQ5	500KΩ	330Ω	0Ω	.1Ω	† 1.4KΩ	† 1KΩ	500KΩ		
V 13	12AU7	† 230KΩ	1.5Meg	0Ω	0Ω	0Ω	† 6.2KΩ	† 65KΩ	2.2KΩ	.1Ω
V 14	6SN7GTA	2.5Meg	▲ 2.5Meg	190Ω	2.2Meg	▲ 5KΩ	2.5KΩ	0Ω	.1Ω	
V 15	6AL5	4.8Meg	4.8Meg	.1Ω	0Ω	13KΩ	NC	13KΩ		
V 16	6SN7GTA	5Meg	† 4.4KΩ	1.5KΩ	220KΩ	† 270KΩ	1.5KΩ	.1Ω	0Ω	
V 17	6CU6	NC	0Ω	TP	† 15KΩ	470KΩ	TP	.1Ω	100Ω	TOP CAP ▲ 17Ω
V 18	6AX4GT	TP	NC	110KΩ	TP	† 44Ω	NC	.1Ω	0Ω	
V 19	1B3GT		PINS	1-8	HAVE	INF	RESISTANCE			TOP CAP ▲ 330Ω
V 20	5U4GA	INF	20KΩ	INF	29Ω	INF	27Ω	INF	20KΩ	
V 21	21ZP4B	0Ω	8.2KΩ	PIN 10 ▲ 3.3KΩ	PIN 11 † 600KΩ	PIN 12 .1Ω				

* MEASURED IN "UHF" POSITION.
† MEASURED FROM PIN 2 OF V20.
▲ MEASURED FROM PIN 3 OF V18.
TP-TIE POINT.
NC-NO CONNECTION.



TUBE PLACEMENT CHART

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	UHF Osc.	6AF4	6AF4	7DK	
V2	RF Amp.	6BZ7	6BZ7	9AJ	
V3	Mixer-Osc.	6U8	6U8	9AE	
V4	1st Video IF Amp.	6CB6	6CB6	7CM	
V5	2nd Video IF Amp.	6CB6	6CB6	7CM	
V6	3rd Video IF Amp.	6CB6	6CB6	7CM	
V7	Video Det. - AGC Rect.	6AL5	6AL5	6BT	
V8	Video Output	12BY7	12BY7	9BF	
V9	Sound IF Amp.	6AU6	6AU6	7BK	
V10	Ratio Det.	6AL5	6AL5	6BT	
V11	AF Amp.	6AV6	6AV6	7BT	
V12	Audio Output	6AQ5	6AQ5	7BZ	
V13	Sync Sep. - Sync Phase Inv.	12AU7	12AU7	9A	
V14	Vert. Osc. - Vert. Output	6SN7GTA	6SN7GTA	8BD	
V15	Horiz. AFC	6AL5	6AL5	6BT	
V16	Horiz. Mult.	6SN7GTA	6SN7GTA	8BD	
V17	Horiz. Output	6CU6	6CU6	6AM	6BQ6GT, 6BQ6GTA, or 6BQ6GA may be used.
V18	Damper	6AX4GT	6AX4GT	4CG	
V19	HV Rect.	1B3GT	1B3GT	3C	
V20	LV Rect.	5U4GA	5U4GA	5T	5U4G may be used.

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CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA: FIRESTONE PART No.	CBS PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	WESTINGHOUSE PART No.	RETMA BASE TYPE	NOTES
V21	21ZP4B ①	21ZP4B ①	21ZP4B ①	21ZP4B ②	21ZP4B ①	12N	① Aluminized
		21ZP4A	21ZP4A	21ZP4A	21ZP4A	12N	② Silver Screen "85"
				21ZP4 ③		12D	③ Circuit changes necessary
	21AWP4 ①	21AWP4 ①		21AWP4 ②	21AWP4 ①	12N	
	21AVP4A ①	21AVP4A ①		21AVP4A ②	21AVP4A ①	12L	
		21AVP4		21AVP4A		12L	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING: CAP.	RATING: VOLT.	REPLACEMENT DATA: FIRESTONE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▬80	300	45X397	AFH2-33-75	B081	FP227.6	TM-D80-350	D-175	TVL-2584
B	▲60	300							
C2A	▬80	300	45X395	AFH2-91-50	B087	FP229.8	TM-3057	T-720	TVL-3704
B	▲100	50							
C3	5	25	45X378	SRE25V5	BR550	TC30	TD-5-25	MMT-0505	TVA-1203
C4A	■10	300	45X410 (Note 1)	AFH3-137	C092	FP230.3	TM-3037	T-695	TVL-3682
B	▲40	50							
C5	30	400	45X393	PRS450V30	BR3045	TC77	TD-30-450	FM-4530	TVA-1711
C6	5	25	45X378	SRE25V5	BR550	TC30	TD-5-25	MMT-0505	TVA-1203

Note 1. Code 334-4-AM58A and 334-4-AS58A use 20MFD in this application.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: FIRESTONE PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C7A	1									
B	2									
C8	1.1									
C9	120			DI-00012	DD-121	G044	811-121	UC-5312	5GA-T12	
C10	10		13M-20A-100D-N-1							
C11	800		13M-23E801Z							
C12	800		13M-23E801Z							
C13	.5-3		31A-056-2		829-3		3115-01-0R5	CT565A		
C14	1500		13L-8XA152Z	BPD-0015	DD-152	K071	801-0015	DC-5215	5HK-D15	
C15	3		13L-8C030H	NP0-SI3	TCZ-3R3	TZ07	NP0A-030	ZT-553	5TCCB-V33	
C16	.5-3		31A-056-1		829-3		3115-01-0R5	CT565A		
C17	800		13M-23E801Z							
C18	47		13L-80470K	BPD-000047	DD-470	G033	831-470	UC-5447	5GA-Q47	
C19	1.5		13L-831R5C	NP0-SI1.5	TCZ-1R5	Z004	NP0A-1R5	ZT-5515	5TCCB-V15	
C20	47		13M-20U470K		MFT-50					
C21	.5-3		31A-056-1		829-3		3115-01-0R5	CT565A		
C22	.5-3		31A-056-1		829-3		3115-01-0R5	CT565A		
C23	10		13L-8U100F	N750-D110	TCN-10	N018	N750K-100	NT-541	5TCU-Q1	
C24	5		13L-8UA050C							
C25	1500		13L-8XA152Z	BPD-0015	DD-152	K071	801-0015	DC-5215	5HK-D15	
C26	220		13L-12D221K	DI-00022	DD-221	G051	811-221	UC-5322	5GA-T22	
C27	800		13M-23E801Z							
C28	800		13M-23E801Z							
C29	800		13M-23E801Z							
C30	1500		13L-8XA152Z	BPD-0015	DD-152	K071	801-0015	DC-5215	5HK-D15	
C31	36		47X627							
C32	47		47X603	SI47	D6-470	TP29	GP1K-470	UC-5447	5GA-Q47	
C33A	1000		80X3	BPD-2X001	DD2-102	DK069	812-001	DCD-521	5HK-2D1	
B	1000									
C34	680		80X5	BPD-00068	DD-681	K065	811-681	UC-5368	5GA-T68	
C35	1000		80X1	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C36A	1000		80X3	BPD-2X001	DD2-102	DK069	812-001	DCD-521	5HK-2D1	
B	1000									
C37	680		80X5	BPD-00068	DD-681	K065	811-681	UC-5368	5GA-T68	
C38	1.5		47X584	NP0-SI1.5	TCZ-1R5	TZ04	NP0A-1R5	ZT-5515	5TCCB-V15	Note 2
C39	150	500	RCM15E151K	NP0-SI150	D6-151	2ZR5T15	811-151	MCB236	MS-315	
C40	680		80X5	BPD-00068	DD-681	K065	811-681	UC-5368	5GA-T68	Note 3
C41	470		80X4	BPD-00047	DD-471	K060	831-471	UC-5347	5GA-T47	
C42	1000		80X1	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C43	1000		80X1	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C44	15		47X605	SI15	D6-150	TP11	GP1K-150	UC-5415	5GA-Q15	
C45	.22	200	RCP10M2224M	P288N-22		CUB2P22		PT4022	2TM-P22	

CAPACITORS (cont)

ITEM No.	RATING CAP	RATING VOLT	REPLACEMENT DATA [illegible] PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C46	1000		[illegible]	BPD-001	DD-102	KD69	801-001	DC-531	5HK-D1	
C47	1000		[illegible]	BPD-001	DD-103	KD69	801-001	DC-532	5HK-D1	
C48	5		47X562	NPO-015	TCZ-4R7	Z0U	NP0A-050	Z7-555	5TCD-V47	
C49	5		57X562	NPO-015	TCZ-4R7	Z0U	NP0A-050	Z7-555	5TCD-V47	
C50	.047	200	RCP10M4743M	BPD-05	DF-503	CUBD847		PT1457	37M-647	
C51	[illegible]		[illegible]	1469-00003		Z028			MS-43	
C52	.1	400	RCP10M4104M	P488N-1	DF-104	CUB4P1		PT461	47M-P1	
C53	1.8		47X184	NPO-01.5	TCZ-1R5		NP0A-1R5	Z7-5515	5TCD-V15	
C54	100		47X304	S1100	D8-101	TP34	GP1K-101	UC-531	5GA-T1	
C55	5000		47X507	BPD-005	DD-503	KD80	811-005	DC-535	5HK-D5	
C56	5000		47X507	BPD-005	DD-502	KD80	811-005	DC-525	5HK-D5	
C57	330	500	47X570	1469-00033	D6-331	SR5T33	811-331		MS-333	
C58	470	500	47X571	1464-00047	D6-471	SR5T47	GP2K-471	MC245	MS-347	
C59	.047	200	RCP10M4743M	BPD-05	DF-503	CUBD847		PT1457	37M-647	
C60	5000		47X507	BPD-005	DD-503	KD80	811-005	DC-535	5HK-D5	
C61A	30000									
B	6000		†7TX25	†PA113-3	†PC-80	†1137MD	†1404-01		†T-1	
C										
C62	.0047	600	RCP10M4742M	BPD-0047	D6-472	KD79	GP2-333-472	PT2347	47M-D47	
C63	330	500	47X370	1469-00033	D6-331	SR5T33	811-331	UC-5333	MS-333	
C64	.01	400	RCP10M4103M	BPD-01	DD-103	CUB4S1	GP3-333-103	PT411	47M-S1	
C65	.047	400	RCP10M4473M	BPD-05	DF-503	CUB4S47		PT1457	47M-647	
C66A	3000							DC-522		
B	5000		*76X7	*PA-110	*PC-100	*1157MD	*1406-01	DC-525	*V-1	
C	5000							DC-525		
C67	.01	400	RCP10M4103M	BPD-01	DD-103	CUB4S1	GP3-333-103	PT411	47M-S1	
C68	033	200	RCP10M2333M	BPD-03	DF-203	CUB4S33	81T-03	PT1233	37M-233	
C69	.047	600	RCP10M6473M	BPD-05	DF-503	CUB6S47		PT1457	37M-647	
C70	.033	500	RCP10M3233M	BPD-03	DF-203	CUB4S33	81T-03	PT1233	37M-233	
C71	.1	600	RCP10M6104M	P668N-1	DF-104	CUB6P1		PT661	47M-P1	
C72	.01		80X1	BPD-001	DD-102	KD69	801-001	DC-531	5HK-D1	
C73	1000		80X1	BPD-001	DD-102	KD69	801-001	DC-531	5HK-D1	
C74	.01	400	RCP10M4103M	BPD-01	DD-103	CUB4S1	GP3-333-103	PT411	47M-S1	
C75	.0047	600	RCP10M4472M	BPD-0047	D6-472	CUB4D47	GP2-333-472	PT2347	47M-D47	
C76	.047	200	RCP10M4743M	BPD-05	DF-503	CUB2S47		PT1457	37M-647	
C77	4700	600	47X543	MCF645	1464-00647			MC645	MS-347	
C78	430	500	RCM30B431K			SR5T33			MS-343	
C79	.047	400	RCP10M4473M	BPD-05	DF-503	CUB4S47		PT1457	47M-647	
C80	330	500	47X570	1469-00033	D6-331	SR5T33	811-331		MS-333	
C81	.047	400	RCP10M4473M	BPD-05	DF-503	CUB4S47		PT1457	47M-647	
C82	.1	400	RCP10M4104M	P488N-1	DF-104	CUB4P1		PT461	47M-P1	
C83	.15	400	RCP10M4154M	P488N-15		CUB4P15		PT4015	47M-P15	
C84	10000	1000	47X615	DAC-27					10HKD-S1	
C85	10000	1000	47X615	DAC-27					10HKD-S1	

Note 2. Some versions use 1MMF in this application.
Note 3. Some versions use 470MMF in this application (part #80X4).
† Items C61A, C61B, C61C, R55A and R55B are combined in one unit.
When replacing items separately C61B and C61C should total 250MMF.
• Items C66A, C66B, C66C, R66A, R66B and R66C are combined in one unit.

CONTROLS

ITEM No.	RESIST-ANCE	WATTS	REPLACEMENT DATA FIRESTONE PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1000Ω	½	7EX21	F1-4	RTV-503	QJ-638 •	UP1SL	Contrast (Panel)
B	1Meg			R2-59			UR16-T254	Volume (Rear)
C	Switch			ES-5			US-27	Attach to R1A.
R2A	500KΩ	½	40X385	BX-59	A47-500K-S	Q1J-133	TA55L	Brightness
B	Shaft		Not Req.	Not Req.	FKS-1/4	Not Req.	Not Req.	Attach to R2A.
R3A	1.5Meg	½	40X386	BX-742	A47-1.5Meg-S	Q1J-138	TA165L	Vertical Hold
B	Shaft		Not Req.	Not Req.	FKS-1/4	Not Req.	Not Req.	Attach to R3A.
R4A	2.5Meg	½	40X369A	AB-83	A47-2.5Meg-S	Q1J-139	TA255L	Height
B	Shaft		Not Req.	AK-1	FKS-1/4	Not Req.	Not Req.	Attach to R4A.
R5A	800Ω	½	40X371	AB-14	A47-1K-S	Q1J-16	TA1KL	Vertical Linearity
B	Shaft		Not Req.	AK-1	FKS-1/4	Not Req.	Not Req.	Attach to R5A.

• Concentrikit Equivalent; K-4 Kit, Base Elements and Shafts; B11-108, P6-218 (Panel)
B13-1375, R16-313 (Rear)
76-2 (Switch)

RESISTORS

ITEM No.	OHMS	WATT	REPLACEMENT DATA FIRESTONE PART No.	IRC PART No.	NOTES
R6	10KΩ	1	12T-AE103M	BTS-10K	
R7	1000Ω		12T-AE102K	BTS-1000	
R8	100Ω			BTS-100	Note 2
R9	47KΩ		12T-AE473M	BTS-47K	
R10	22KΩ		12T-AE223K	BTS-22K	
R11	270KΩ		12T-AE274K	BTS-270K	
R12	180KΩ		12T-AE184K	BTS-180K	
R13	68KΩ		12T-AE683K	BTS-68K	
R14	33000Ω		13B-AE333K		
R15	33KΩ		12T-AE333M		
R16	10KΩ		12T-AE103M		
R17	3300Ω		12T-AE332K		
R18	6800Ω				
R19	100KΩ		12T-AE104K		
R20	100KΩ		12T-AE104K		
R21	100KΩ		12T-AE104K		
R22	82000Ω		12T-AE823K		
R23	1000Ω		B8502	BTS-1000	
R24	33000 5%		B83323		
R25	47Ω		B8547I	BTS-47Ω	
R26	47Ω 5%		B8547Q	BTS-47 5%	
R27	150Ω		B8551	BTS-150	
R28	39KΩ 5%		B83923		
R29	470Ω		B8547I	BTS-47Ω	
R30	47Ω 5%		B8547Q	BTS- 47 5%	
R31	4000Ω	5	43X386	PW7-4000	
R32	39KΩ 5%		B83923		
R33	470Ω		B8547I	BTS-47Ω	Note 1
R34	180Ω		B8618I	BTS-180	
R35	470KΩ		B8547A	BTS-470K	
R36	1Meg		B8610S	BTS-1Meg	
R37	47KΩ		B8547S	BTS-47K	
R38	33000 5%		B83323	BTS-3300 5%	
R39	1Meg		B8610S	BTS-1Meg	
R40	2000Ω 5%	2	D83302	BTB-2000 5%	
R41	2000Ω 5%	2	D83302	BTB-2000 5%	
R42	47Ω		B8547G	BTS-47	
R43	82000		B84623	BTS-8200	
R44	3300Ω		C84323	BTA-3300	
R45	470KΩ		B8547A	BTS-470K	

ITEM No.	OHMS	WATT	REPLACEMENT DATA FIRESTONE PART No.	IRC PART No.	NOTES
R46	56KΩ		B84563	BTS-56K	
R47	33KΩ		B84333	BTS-33K	
R48	33KΩ		B84333	BTS-33K	Note 2
R49	100Ω		B83U01	BTS-1000	
R50	270Ω		B8427I	BTS-270	
R51	150KΩ		B84151	BTS-150K	
R52	10KΩ 5%		B83103	BTS-10K 5%	
R53	10KΩ 5%		B83103	BTS-10K 5%	
R54	10Meg		B8510M	BTS-10Meg	
R55A	500KΩ		† 76X5	BTS-470K	
B	500KΩ			BTS-470K	
R56	1000Ω		D84103	BTS-1000	
R57	33Ω		C84331	BTA-330	
R58	10KΩ		B84103	BTS-10K	
R59	150KΩ		B84154	BTS-150K	
R60	1.5Meg		B84159	BTS-1.5Meg	
R61	270KΩ		B84274	BTS-270K	
R62	330KΩ		B84334	BTS-330K	
R63	47KΩ		B84473	BTS-47K	
R64	1Meg		B8410S	BTS-1Meg	
R65	2200Ω 5%		B83222	BTS-2200 5%	
R66	1500		B84152	BTS-1500	Note 3
R67	2200Ω 5%		B83223	BTS-2200 5%	
R66A	220Ω			BTS-22K	
B	2200Ω		• 76X7	BTS-2200	
C	2200Ω			BTS-2200	
R68	22KΩ		B84223	BTS-22K	
R70	1.5Meg		B84155	BTS-1.5Meg	Note 4
R71	22KΩ		B84223	BTS-22K	
R72	2.2Meg		B84225	BTS-2.2Meg	
R73	1.5Meg		B84155	BTS-1.5Meg	
R74	820Ω		B84821	BTS-820	
R75	2.2Meg		B84225	BTS-2.2Meg	
R76	120KΩ		B84124	BTS-120K	Note 5
R77	560Ω				
R78	100KΩ		B84104		
R79	4.7Meg		B85475		
R80	27KΩ		B84273		
R81	18KΩ		C84183		
R82	100KΩ		B84104		

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS (cont)

ITEM No.	OHMS	WATT	REPLACEMENT DATA FIRESTONE PART No.	IRC PART No.	NOTES
R83	470KΩ	½	B85474		
R84	43000 5%	1	C85433		Note 6
R85	220KΩ	½	B84224		
R86	220KΩ	½	B84224		
R87	47KΩ	1	C84473		
R88	47KΩ	½	B84473		
R89	8200Ω	½	B84823		
R90	1500Ω	½	B83153		
R91	470KΩ	1	B84474		

ITEM No.	OHMS	WATT	REPLACEMENT DATA FIRESTONE PART No.	IRC PART No.	NOTES
R92	68Ω	1	B85680		
R93	15KΩ	2	D84153		Note 6
R94	100Ω	2	D84101		
R95	5800Ω	1	B84562		
R96	3.3Ω	½	43X333	BW½-3.3	
R97	25000	10	43X2597	PW10-2500	
R98	100KΩ	3	D85104	BTB-100K	
R99	270KΩ	½	B85274	BTS-270K	
R100	100KΩ	1	B84104	BTS-100K	Note 7

Note 1. Some versions use a 1500Ω ½W resistor in this application.
Note 2. Some versions use a 100KΩ ½W resistor in this application.
Note 3. Some versions use a 3300Ω ½W resistor in this application.
Note 4. Some versions use a 3.3Meg ½W resistor in this application.
Note 5. Some versions use a 220KΩ ½W resistor in this application.
Note 6. Some versions use a 82000 7W resistor in this application.
Note 7. Used only in models using 31AV2P4A or 21AUP4A picture tube.
† Items C61A, C61B, C61C, R55A, R55B are combined in one unit.
• Items C66A, C66B, C66C, R66A, R66B, R66C are combined in one unit.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	SEC. 1	SEC. 2	SEC. 3	REPLACEMENT DATA FIRESTONE PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC 60 CYCLE	5VCT @1.6A	6.3VAC @3A	6.3VAC @5.3A	53X340A		P-3257 ①			R-44BX ②

① Tape 6.3V ③ 1.2A winding.
② Parallel and phase 6.3V windings for secondary #3.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA FIRESTONE PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T2	Vert. Osc. Trans.	54X10	B8702	A-3003	20VT1 ↓	V405	A-8125	28A03	A-91X
T3	Horiz. Output Trans.	53X342 ②	FB640 •	HVO-41 •	232T1 • ↓	X110 •	A-8264 •	FLY-37 •	D-35 • ↑
		53X247 ③ ↓	FB440 •	HVO-41 •	232T1 • ↓	X110 •	A-8264 •	FLY-37 •	D-35 • ↓
T4	Vert. Output Trans.	51X168	21B06 ↓	A-3039 ↓	235T1 ↓	V312 ↓	A-8141 ↓	26S54 ↓	A-104X ↓
T5A	Yoke-Horiz. (13.5MH)	9A3334-1 ③ ↓	DF602 ③	MDF-73 ③	21UD2 ③	Y70F14 ③	DY-9A ③	Y-4 ③	Y-17 ③
B	Vert. (46MH)	9A3334-3 ③ ↓ 2A435 ③ ↓	DF602 ③	MDF-73 ③	21UD2 ③	Y70F14 ③	DY-9A ③	Y-4 ③	Y-17 ③

① Drill new mounting hole(s).
② Used in models having code No. 334-4-AM54A.
③ Used in models having code No. 334-4-AM58A.
④ Used in models having code No. 334-4-AS58A.
⑤ Yoke rear cover & centering device.
⑥ Includes resistor R77.
⑦ Use orig. yoke damping network.
⑧ Use orig. yoke rear cover & centering device.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type Is Listed

ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
9	13	6	10	13	6	13	10
5	JUMPER 10 & 11	5	8	Jumper 10 & 11	5	Jumper 10 & 11	8
4	6	4	6	6	4	6	6
3	5	3	See Note ⑤	5	3	5	See Note ⑤
1	1 or 2	1	3	1 or 2	2	1 or 2	3
A	9	A	1	9	A	9	1
G	8	G	2	8	G	8	2
Special Notes			⑤				⑥ ⑦

⑤ No connection to trans. connect a damping capacitor (approx. 47-68MMF ② 2KV) in series with R77, across horiz. yoke terms #3 & #7.
⑥ Jumper terms #9 & "T".

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE	REPLACEMENT DATA FIRESTONE PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T6	4.75KΩ 3.3Ω	51X187	21U07	A-3038	A-3877	24S51	S-5X	

SPEAKER

ITEM No.	RATINGS SIZE	FIELD	V. C. IMP.	REPLACEMENT DATA FIRESTONE PART No.	QUAM PART No.	RCA TYPE No.	NOTES
SP1	5"	PM	3.2Ω	12A522	5A2I	20S82	① Alternate speaker used on some versions.
	6"	PM	3.2Ω	12A516	6A1	22S81	

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA FIRESTONE PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	UHF Ant. Coil	0Ω		31K-137-04				
L3	UHF Ant. Coil	0Ω		31K-137-06				
L3A	UHF Ant., Mixer, Osc. Coils	0Ω		9A2331-10				Channels 14 thru 19
B	UHF Ant., Mixer, Osc. Coils	0Ω		9A2331-20				Channels 20 thru 29
C	UHF Ant., Mixer, Osc. Coils	0Ω		9A2331-30				Channels 30 thru 39
D	UHF Ant., Mixer, Osc. Coils	0Ω		9A2331-40				Channels 40 thru 49

COILS (cont)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA FIRESTONE PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
E	UHF Ant., Mixer, Osc. Coils	0Ω		9A2331-50				Channels 50 thru 59
F	UHF Ant., Mixer, Osc. Coils	0Ω		9A2331-60				Channels 60 thru 69
G	UHF Ant., Mixer, Osc. Coils	0Ω		9A2331-70				Channels 70 thru 79
H	UHF Ant., Mixer, Osc. Coils	0Ω		9A2331-80				Channels 80 thru 83
L4	RF Choke	0Ω						
L5A	Fil. Choke	0Ω						
B	Fil. Choke	0Ω		31K-137-07				
L6	UHF IF Coil							
L7	RF Choke							
L8	Cathode Choke	0Ω		31K-137-02				
L9	UHF IF Input Coil	0Ω	.1Ω					
L10	UHF IF Interstage	.3Ω						
L11	UHF IF Interstage	.3Ω	.1Ω					
L12A	VHF Ant. Coil	0OCT	0Ω	9A2329-3				Channel 3
B	VHF Ant. Coil	0OCT	0Ω	9A2329-3				Channel 3
C	VHF Ant. Coil	0OCT	0Ω	9A2329-4				Channel 4
D	VHF Ant. Coil	0OCT	0Ω	9A2329-5				Channel 5
E	VHF Ant. Coil	0OCT	0Ω	9A2329-6				Channel 6
F	VHF Ant. Coil	0OCT	0Ω	9A2329-7				Channel 7
G	VHF Ant. Coil	0OCT	0Ω	9A2329-8				Channel 8
H	VHF Ant. Coil	0OCT	0Ω	9A2329-9				Channel 9
I	VHF Ant. Coil	0OCT	0Ω	9A2329-10				Channel 10
J	VHF Ant. Coil	0OCT	0Ω	9A2329-11				Channel 11
K	VHF Ant. Coil	0OCT	0Ω	9A2329-12				Channel 12
L	VHF Ant. Coil	0OCT	0Ω	9A2329-13				Channel 13
L15	Neut. Coil	0Ω						
L16A	VHF RF Mixer Grid, Osc. Coils	0Ω		9A2330-3				Channel 3
B	VHF RF Mixer Grid, Osc. Coils	0Ω		9A2330-3				Channel 3
C	VHF RF Mixer Grid, Osc. Coils	0Ω		9A2330-4				Channel 4
D	VHF RF Mixer Grid, Osc. Coils	0Ω		9A2330-5				Channel 5
E	VHF RF Mixer Grid, Osc. Coils	0Ω		9A2330-6				Channel 6
F	VHF RF Mixer Grid, Osc. Coils	0Ω		9A2330-7				Channel 7
G	VHF RF Mixer Grid, Osc. Coils	0Ω		9A2330-8				Channel 8
H	VHF RF Mixer Grid, Osc. Coils	0Ω		9A2330-9				Channel 9
I	VHF RF Mixer Grid, Osc. Coils	0Ω		9A2330-10				Channel 10
J	VHF RF Mixer Grid, Osc. Coils	0Ω		9A2330-11				Channel 11
K	VHF RF Mixer Grid, Osc. Coils	0Ω		9A2330-12				Channel 12
L	VHF RF Mixer Grid, Osc. Coils	0Ω		9A2330-13				Channel 13
L17	IF Trap	.1Ω		9A2315				
L18	1st Video IF	.1Ω		9A2317		TV-136	6312	Includes 47.25MC Trap
L19	2nd Video IF	.7Ω	.2Ω	9A2318			6313	2.3 Microhenries
L20	Fil. Choke	0Ω		9A3033	19-1002		4606	
L21	3rd Video IF	.2Ω	.2Ω	9A2316	19-5003 •	TV-138 •	6323 •	
L22	Parasitic Suppressor	0Ω		9A3223				1 turn wire wound on 10Ω resistor; 2.2 Microhenries
L23	Fil. Choke	0Ω		9A3033	19-1002		4606	
L24	Cathode Trap	0Ω	0Ω	9A3221				
L25	4th Video IF	.8Ω	.8Ω	9A3219	19-5004	TV-135	6324	
L26	Series Peaking Coil	7.8Ω		36A30	19-2075		4630	80 Microhenries
L27	Series Peaking Coil	10Ω		36A1	19-2102	TV-151	6177	100 Microhenries
L28	4.5MC Trap	3.3Ω		9A2336	20-1004	TV-151	1469	
L29	Series Peaking Coil	20Ω		36A38	19-2300 ■	TV-180 ■	6185 ■	250 Microhenries; Wound on 6.8KΩ resistor
L30	Shunt Peaking Coil	15Ω		36A39	19-3180 ▲	TV-184 ▲	6184 ▲	190 Microhenries; Wound on 2.7KΩ resistor
L31	Series Peaking Coil	10Ω		36A1	19-2102	TV-151	6177	100 Microhenries
L32	Sound IF	2.2Ω		9A2201	17-1031 ▲	TV-115 •	6303 •	Tertiary Winding- 4Ω
L33	Ratio Det.	4.3Ω	.7DCT	9A2195	17-1497	TV-116	6305	

• Detune trap.
■ Parallel with 6.8KΩ resistor.
▲ Parallel with 2.7KΩ resistor.
△ Drill mounting holes.
• Use one winding only.

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA FIRESTONE PART No.	MEISSNER PART No.	MERIT PART No.	RCA TYPE No.	Ram PART No.	Thordarson PART No.	NOTES
L34	68Ω		9A3273	19-1576	TV-163	6310		28S-5	

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (D. CURRENT 1000 "A")	REPLACEMENT DATA FIRESTONE PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L35	230A	39.8Ω	1.05HY	52X95	C8037 △	C-2969 △	C-3325 △	26C44	C-23X △

△ Drill one new mounting hole.

PARTS LIST AND DESCRIPTIONS (Continued)

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			FIRESTONE PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG S/B	4/10A 125V	16X147-3	16X146	313. 400 (3AG S/B 4/10A)	357001	MDL 4/10	4405

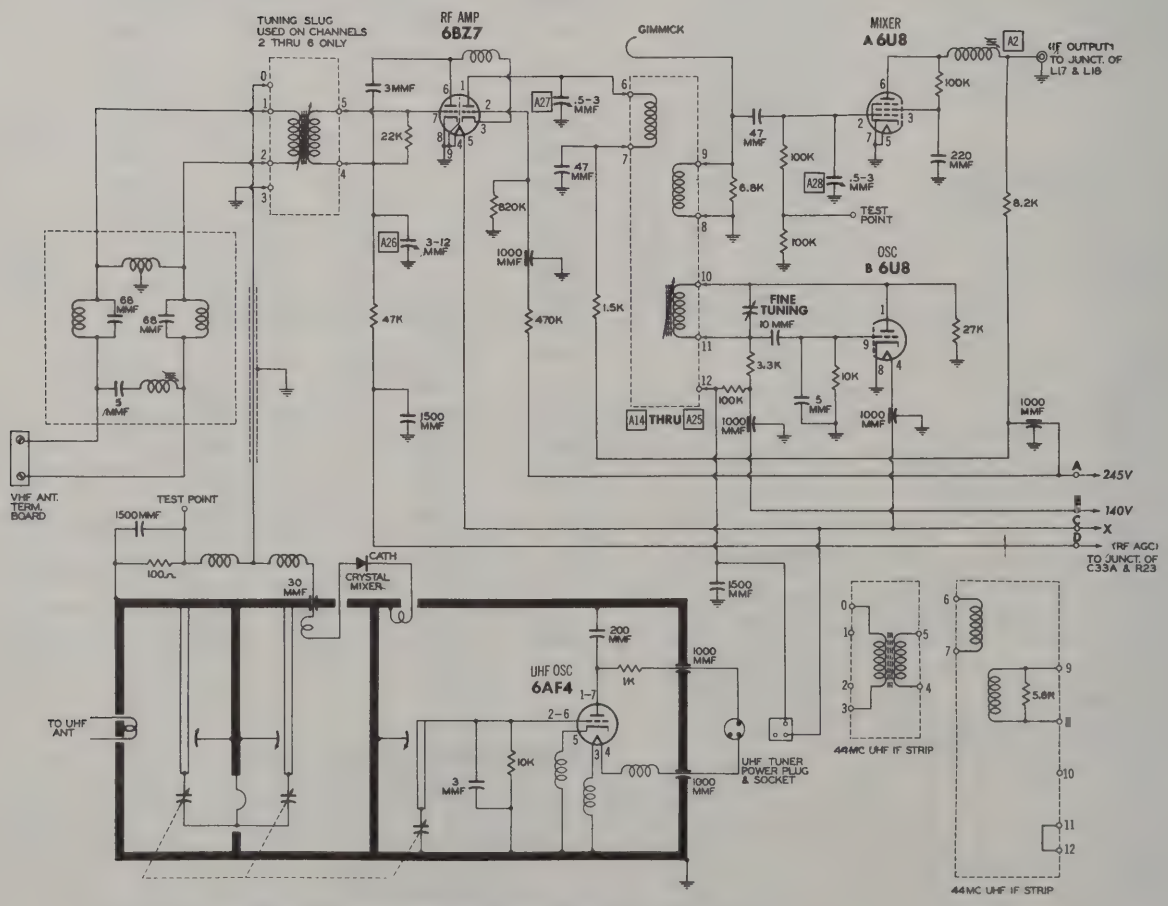
CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA		NOTES
		FIRESTONE PART No.	SYLVANIA PART No.	
M2	1N82A *	31K-111	1N82 or 1N82A	UHF Mixer

* Some versions may use type 1N82 crystal diode in this application.

MISCELLANEOUS

ITEM No.	PART NAME	FIRESTONE PART No.	NOTES
M3	Dial Light	7A32	#51
M4	Tuner	25A1124	VHF-UHF-Code 334-4-AM54A
	Tuner	25X1128	VHF-UHF-Code 334-4-AM58A
	Tuner	25A1128	VHF-UHF-Code 334-4-AS58A
M5	Trap	31K-225	VHF Ant. Input Filter-Code 334-4-AM54A
	Trap	31K-225-03	VHF Ant. Input Filter-Codes 334-4-AM58A, 334-4-AS58A
M6	Focus Magnet	2A438-3	Includes Centering Device-Codes 334-4-AM58A, 334-4-AM54A
M7	Centering Device	2A435	Code 334-4-AS58A, Includes deflection yoke (T5)
			Rear Cover
M8	Ion Trap	2A421	
B1	Trimmer Cap.	17A269	Horiz. Drive (120-400MMF)



UHF-VHF TUNER PART NO. 25A1128 USED WITH CHASSIS CODED 334-4-AS58A

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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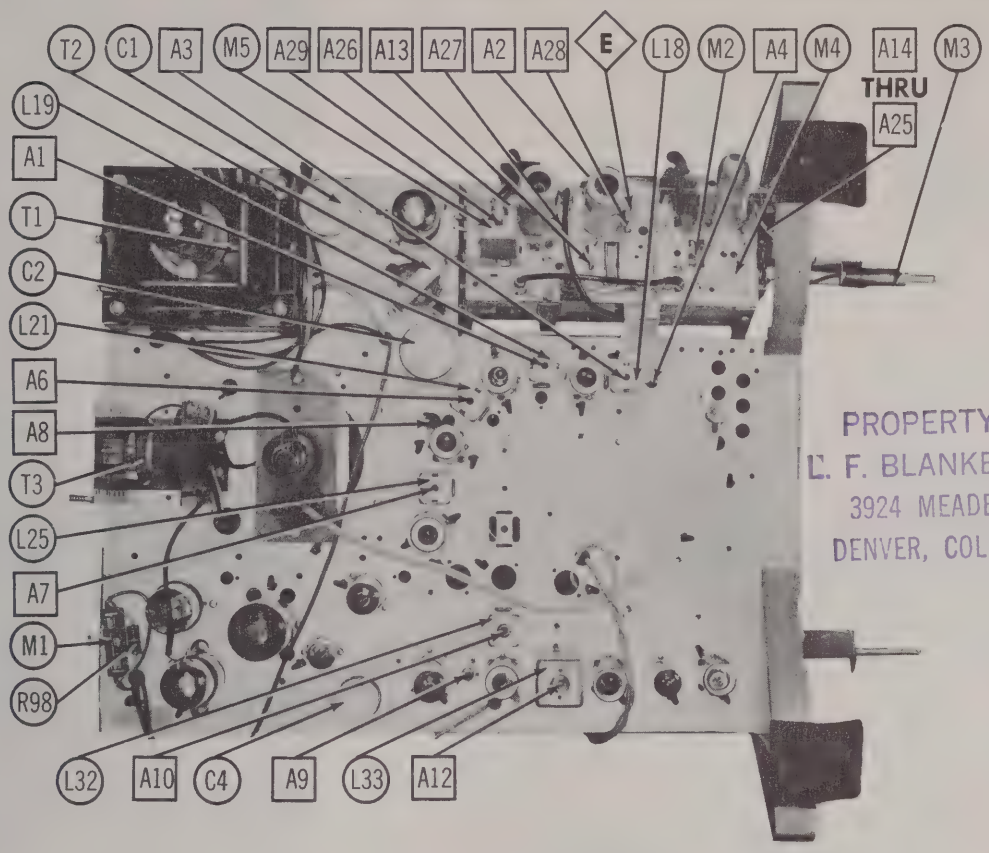
ALTERNATE TUNER SCHEMATIC



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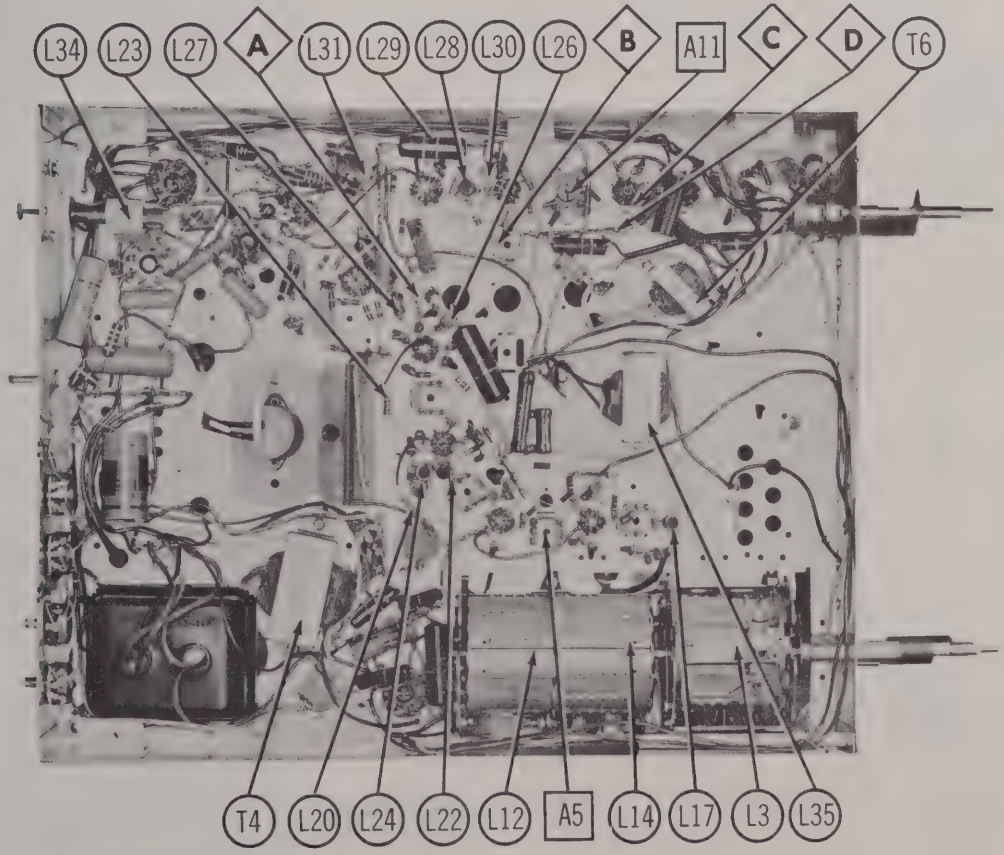
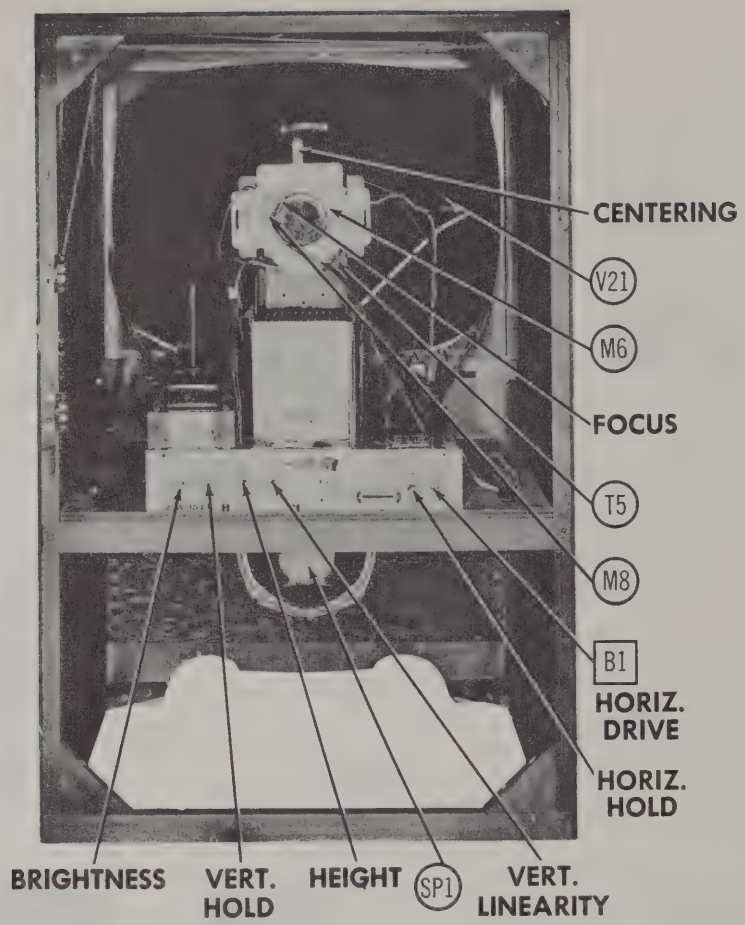
DENVER, COLORADO

CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENT.

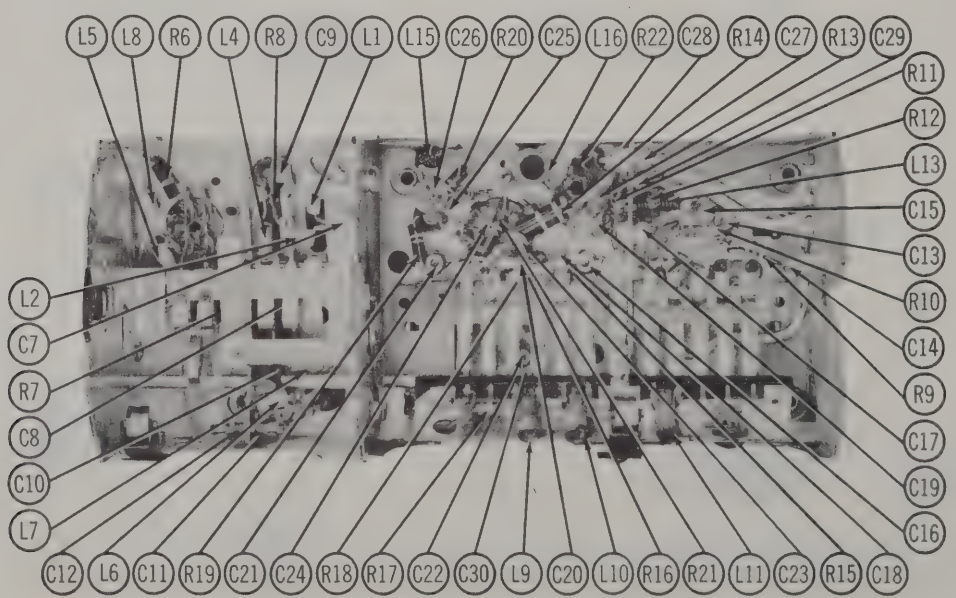


CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern. Adjust the horizontal hold (L32) until the picture synchronizes horizontally. Switch off channel and back again. Picture should now be locked in sync. If not, slightly readjust L32.

Turn contrast control maximum counter clockwise and brightness control for maximum brightness. Turn the horizontal drive trimmer (B1) clockwise until white bars or compression near center of the raster appears. Then turn B1 counter clockwise until the white bars or compression disappears.



TUNER BOTTOM VIEW

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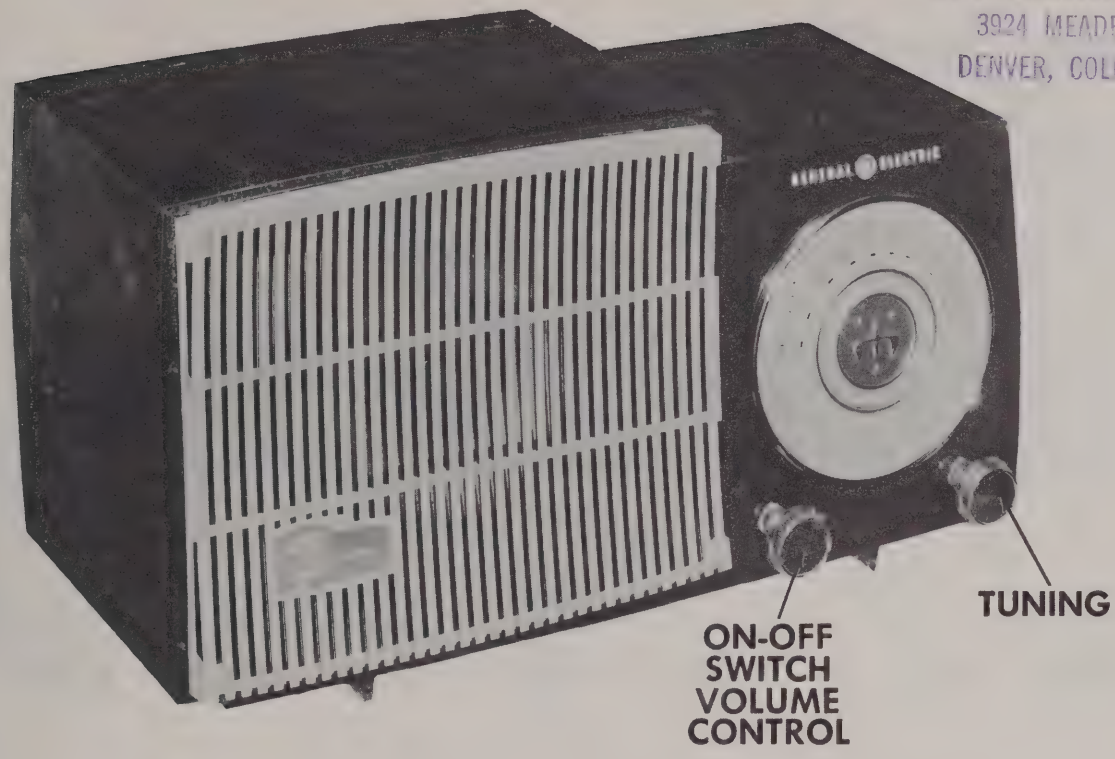
3924 MEADE ST.
DENVER, COLORADO



GENERAL ELECTRIC
MODELS 475, 476, 477

TRADE NAME	General Electric Models 475, 476, 477
MANUFACTURER	General Electric Co., Electronics Dept., Electronics Park, Syracuse, N. Y.
TYPE SET	AC-DC Operated AM Superheterodyne Receiver
TUBES (Five)	Types 12BE6 Converter, 12BA6 IF Amp., 12AV6 Det. -AVC-AF Amp., 50C5 Output, 35W4 Rectifier
POWER SUPPLY	105-120 Volts AC-DC
RATING	.25 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	540KC-1600KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Use isolation transformer, if available. If not, connect a .1MFD capacitor in series with low side of signal generator and B-.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.01MFD	High side to pin 7 (grid) of 12BE6 (V1). Low side to B-.	455KC (400∿ Mod.)	Tuning gang fully open	Across Voice Coil	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.		Loop	1620KC	"	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	1500KC	Tune to 1500KC signal		A6	Adjust for maximum output while rocking tuning gang.

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		General Electric PART No.	STANDARD REPLACEMENT		
V1	Converter	12BE6	12BE6	7CH	
V2	IF Amp.	12BA6	12BA6	7BK	
V3	Det. -AVC-AF Amp.	12AV6	12AV6	7BT	
V4	Output	50C5	50C5	7CV	
V5	Rectifier	35W4	35W4	5BQ	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	General Electric PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	100	150	RCE-177	PRS150V8040-20	BBRT84215	TCT3117	TDL-804020-150	FMT-1540	TVA-3455
B	50	150							

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	General Electric PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	.05	400	UCC-045	BPD-05	DF-503	CUB4S5		PT415	4TM-S5	
C3	47		RCW-3075	SI47	DD-470	GO33	831-470	UC-5447	5GA-Q47	
C4	220		RCW-3195	SI220	DD-221	GO51	811-221	UC-5322	5GA-T22	
C5	.02	400	RCC-129	BPD-02	DF-203	CUB4S2	817-02	PT412	4TM-S2	
C6	220		RCN-3195	SI220	DD-221	GO51	811-221	UC-5322	5GA-T22	
C7	.02	400	RCC-129	BPD-02	DD-203	CUB4S2	817-02	PT412	4TM-S2	
C8A	500		RCW-3104	SI500	D6-501	KO61	811-501	UC-535	5GA-T5	
B	6800			SI6800	D6-682	KO81	811-0068	5HK-D68	5HK-D68	
C9	.047	200	RCC-126	BPD-05	DF-503	CUB2S47		PT4147	2TM-S47	
C10	.047	200	RCC-126	BPD-05	DF-503	CUB2S47		PT4147	2TM-S47	
C11	.047	600	RCN-053	BPD-05	DF-503	CUB6S47		PT6147	6TM-S47	
C12	.05	400	UCC-045	BPD-05	DF-503	CUB4S5		PT415	4TM-S5	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	General Electric PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1	4Meg	½	RRC-328					Volume & Switch-Tap at 2Meg

RESISTORS

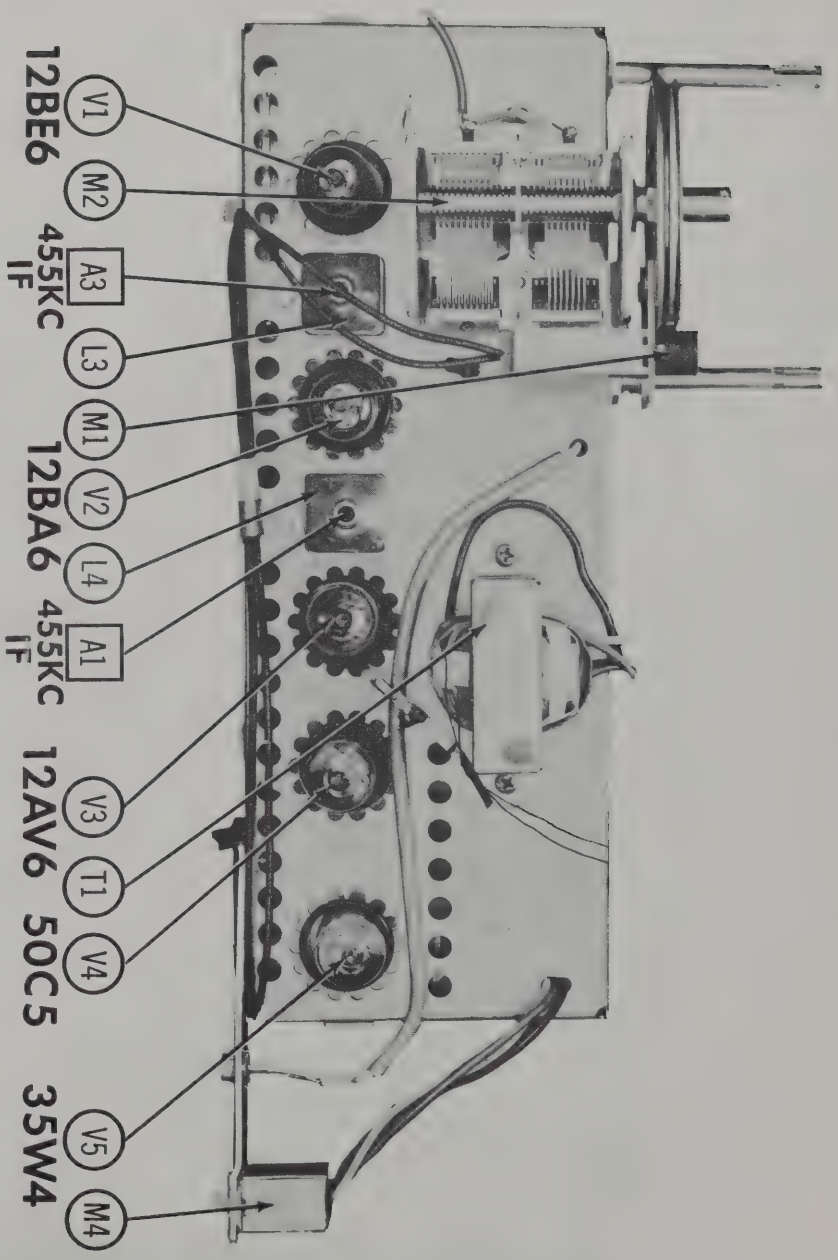
ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	General Electric PART No.	IRC PART No.	
R2	22KΩ	½	URD-081	BTS-22K	
R3	100Ω	½	URD-025	BTS-100	
R4	2.2Meg	½	URD-129	BTS-2.2Meg	
R5	68Ω	½	URD-021	BTS-68	
R6	330KΩ	½	URD-109	BTS-330K	
R7	6.8Meg	½	URD-141	BTS-6.8Meg	
R8	470KΩ	½	URD-113	BTS-470K	
R9	470KΩ	½	URD-113	BTS-470K	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	General Electric PART No.	IRC PART No.	
R10	4700Ω	½	URD-065	BTS-4700	
R11	1500Ω	2	URF-053	BTB-1500	
R12	150Ω	½	URD-029	BTS-150	
R13	820Ω	½	URD-047	BTS-820	
R14	15KΩ	½	URD-077	BTS-15K	
R15	4700Ω	½	URD-065	BTS-4700	
R16	18Ω	½	URD-007	BTS-18	

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	General Electric PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	2.4KΩ	3.4Ω Sec. 2 61Ω RES.	RTO-145						

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

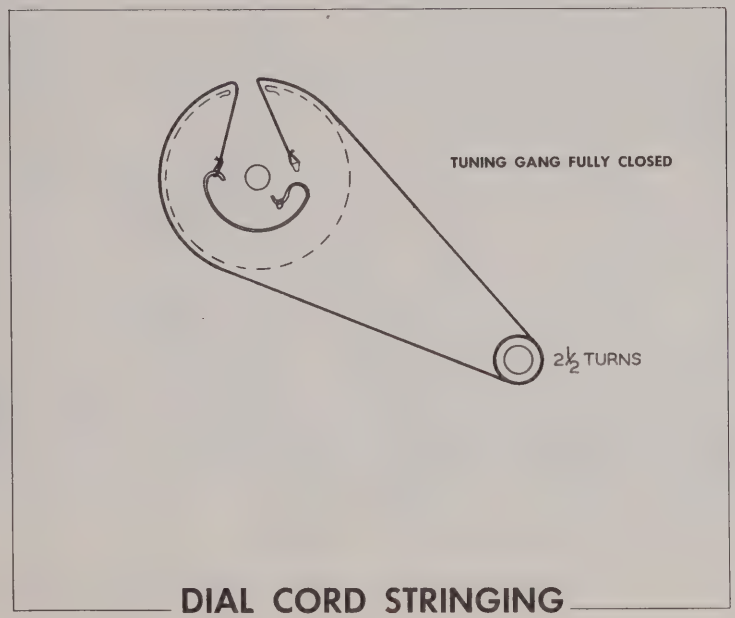
ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	General Electric PART No.	QUAM PART No.	RCA TYPE No.	
SP1	6"	PM	3.4Ω	S625C7	6A1	229S1	

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	General Electric PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Ant. Coil	.5Ω		RLL-055				
L2	Osc. Coil	.6Ω	6.5Ω	RLC-122	14-1074	BC-394	70-Osc.	
L3	Input IF	14Ω	16Ω	RTL-143	16-6780	BC-352	12-C1	
L4	Output IF	14Ω	14Ω	RTL-143	16-6780	BC-353	12-C2	

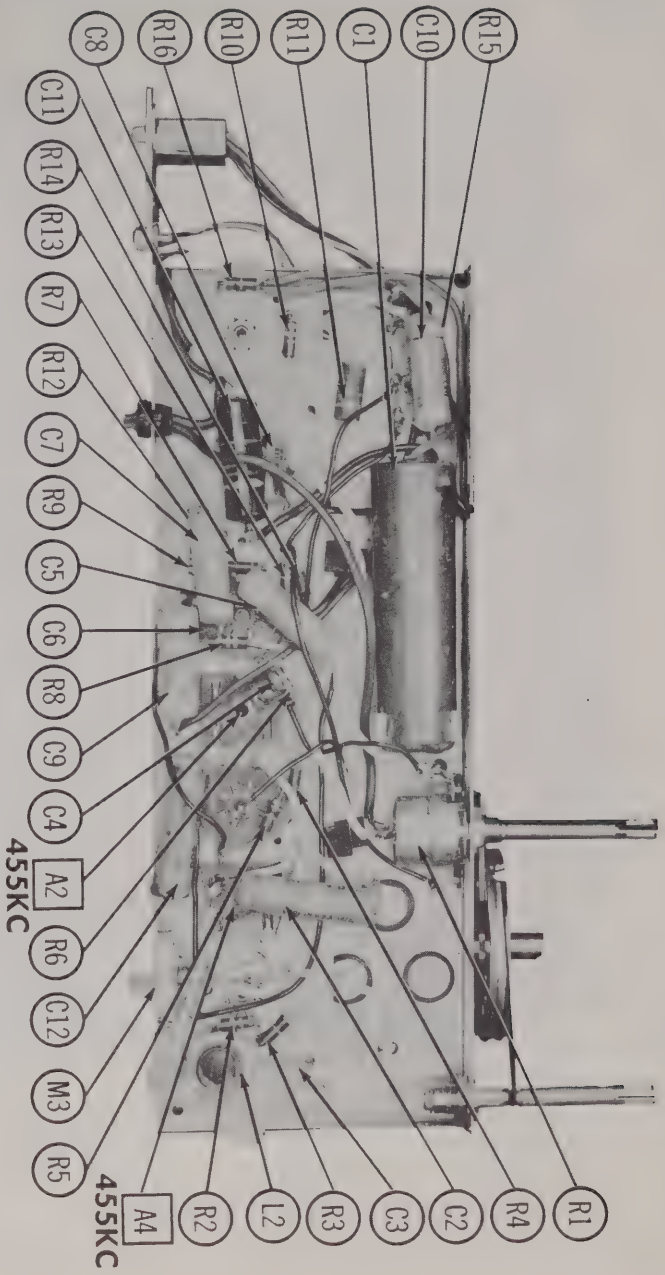
MISCELLANEOUS

ITEM No.	PART NAME	General Electric PART No.	NOTES
M1	Dial Light		#44
M2	Tuning Cap.	RCT-089	2 Gang (20-315MMF, 30-150MMF)
M3	Switch	RSS-009	Radio-Phono (SPDT-Slide Type)
M4	Switch	RSW-067	Tone (SPDT- Slide Type)
	Cabinet	RAU-446	Model 475
	Cabinet	RAU-447	Model 476
	Cabinet	RAU-448	Model 447
	Knob	RDK-425	On-off-volume & tuning
	Dial Pointer	RDP-086	
	Dial Scale & Window	RDW-094	



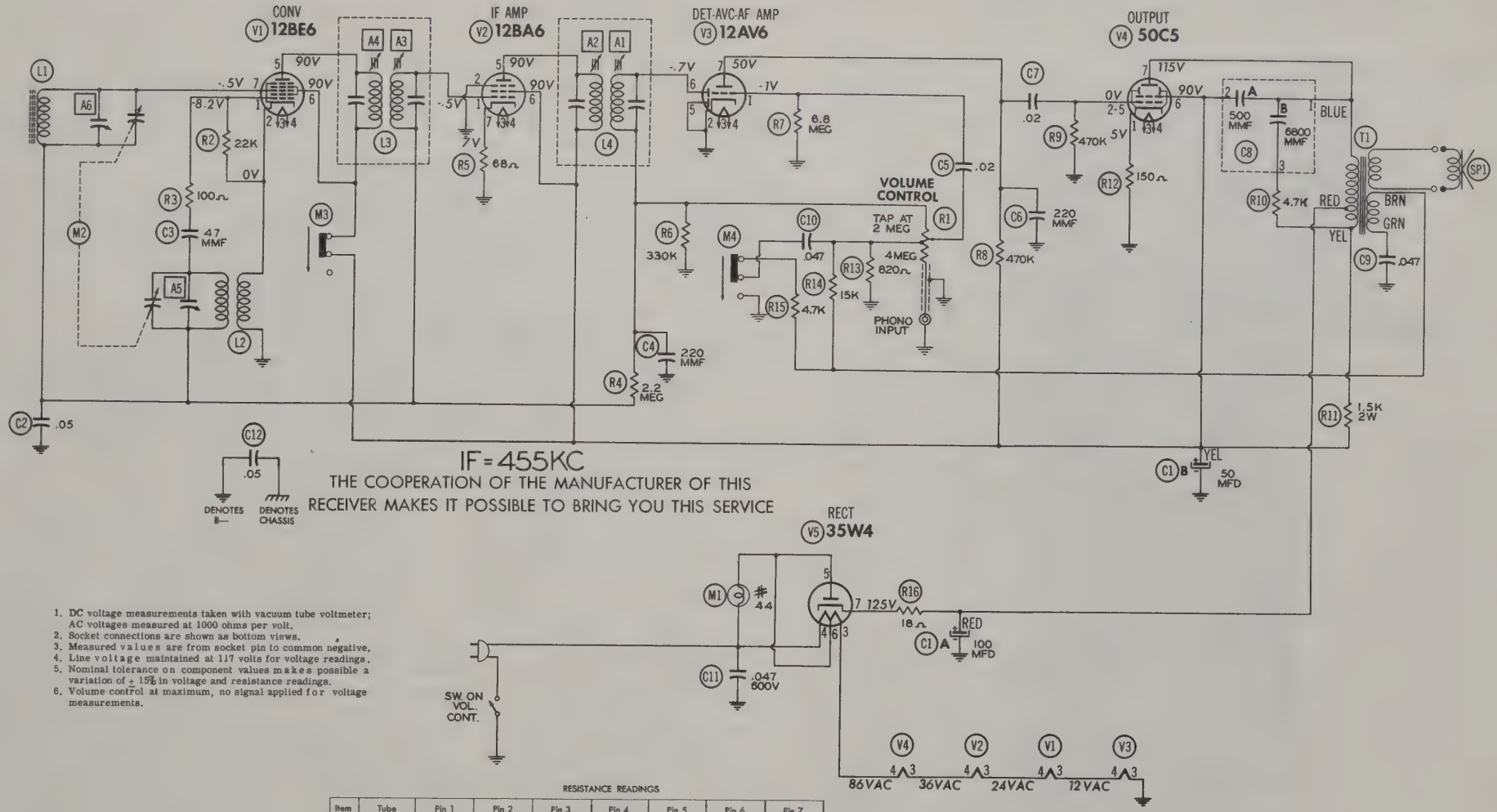
DIAL CORD STRINGING

CHASSIS—BOTTOM VIEW



Denver, Colorado

GENERAL ELECTRIC
Model 475



IF = 455KC

THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12BE6	22KΩ	. 6Ω	12Ω	24Ω	† 1. 5KΩ	† 1. 5KΩ	2. 8Meg
V 2	12BA6	2. 4Meg	0Ω	24Ω	36Ω	† 1. 5KΩ	† 1. 5KΩ	68Ω
V 3	12AV6	6. 8Meg	0Ω	0Ω	12Ω	0Ω	330KΩ	† 471KΩ
V 4	50C5	150Ω	470KΩ	36Ω	86Ω	470KΩ	† 1. 5KΩ	† 278Ω
V 5	35W4	TP	TP	86Ω	121Ω	115Ω	115Ω	10KΩ

ALL MEASUREMENTS TAKEN IN RADIO POSITION.
† MEASURED FROM PIN 7 OF V5.
TP-TIE POINT.

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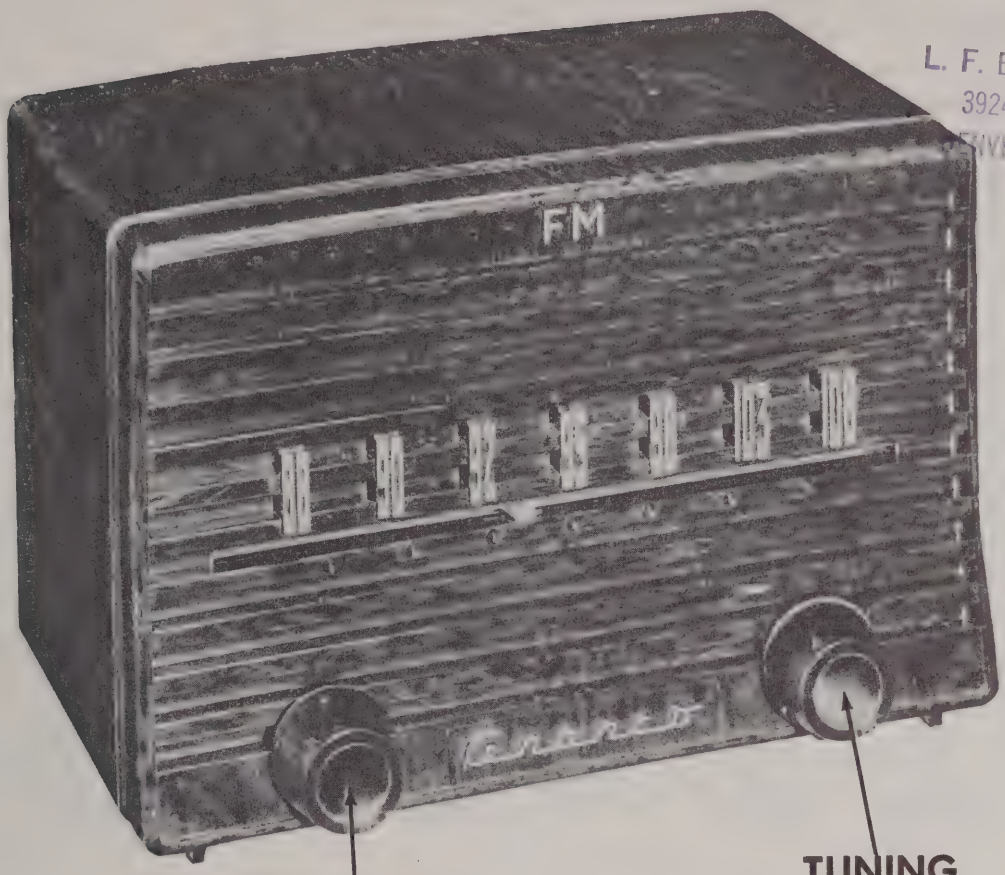

GRANCO
MODEL T-160

TRADE NAME	Granco Model T-160
MANUFACTURER	Granco Products, Inc., 36-17 20th. Ave., Long Island City 5, N.Y.
TYPE SET	AC Operated FM Superheterodyne Tuner
TUBES (Five)	Types 6BA6 RF Amp., 12AT7 Mixer-Osc., 6BA6 1st. IF Amp., 6BA6 2nd. IF Amp., 6AL5 Ratio Det.
POWER SUPPLY	105-120 Volts AC-60 Cycles RATING .32 Amp. @ 117 Volts AC
TUNING RANGE-	FM 88MC-108MC

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		GRANCO PART No.	STANDARD REPLACEMENT		
V1	RF Amplifier	6BA6	6BA6	7BK	
V2	Mixer-Osc.	12AT7	12AT7	9A	
V3	1st. IF Amp.	6BA6	6BA6	7BK	
V4	2nd. IF Amp.	6BA6	6BA6	7BK	
V5	Ratio Det.	6AL5	6AL5	6BT	

ELECTROLYTIC CAPACITORS

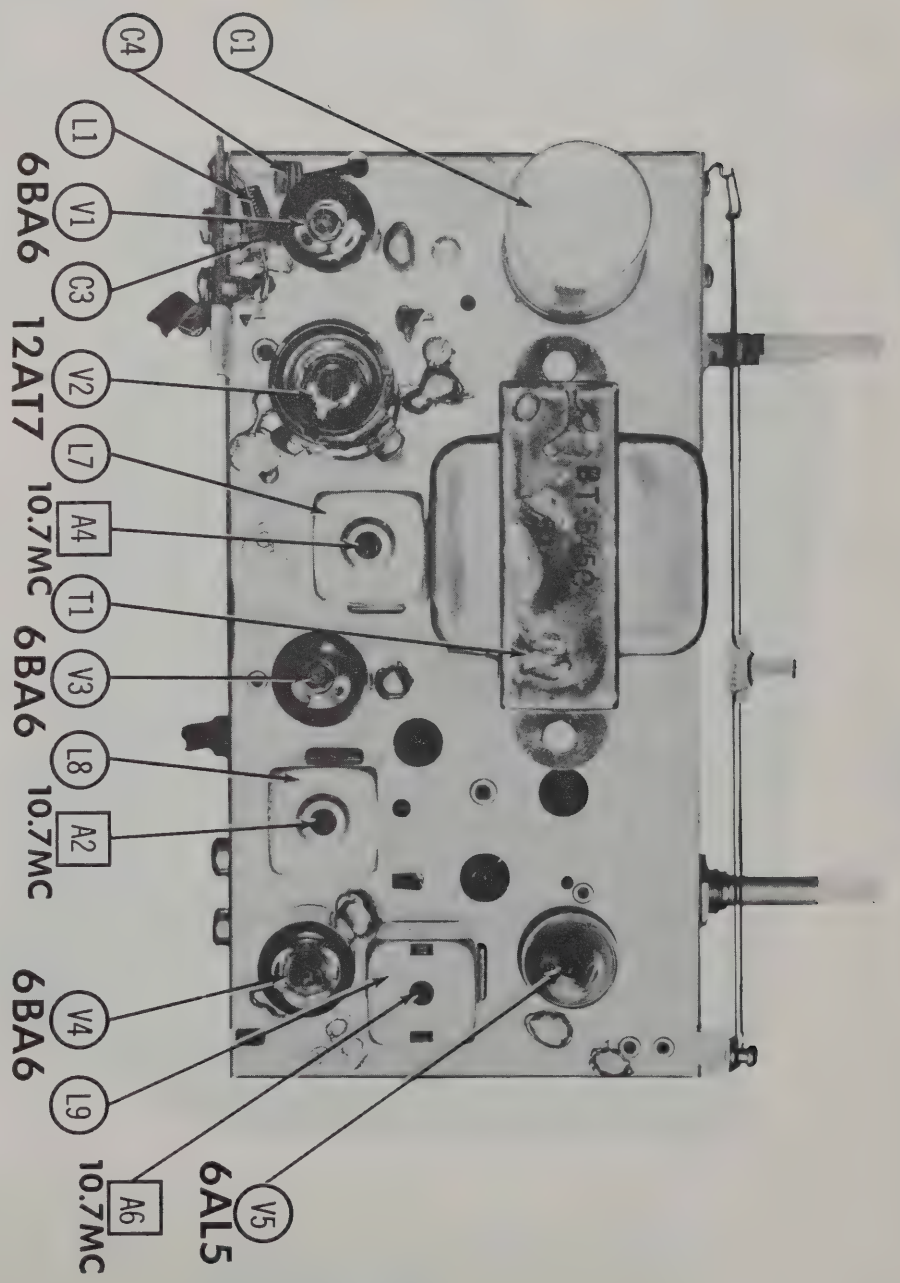
ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	GRANCO PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲80	150	C-471	PRS150V-804020	BBRD8415	TCD498	TM-8050-150	FMT-1540	TVA-3455
B	■50	150							
C2	2	50	C-502	PRS50V2	BBR-2-50T	TC302	TD-2-50	MMT-0505	TVA-1301

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	GRANCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3	10		C-504	NP0-SI10	TCZ-10	TZ09	NP0A-100	ZT-541	5TCC-Q1	
C4	50		C-503	NP0-SI50	TCZ- 50	TZ23	NP0-338-500	ZT-545	5TCC-Q5	
C5	2000									
C6	50		C-503	NP0-SI50	TCZ-50	TZ23	NP0-338-500	ZT-545	5TCC-Q5	
C7	.27		C-506							
C8	80		C-518							
C9	8.5		C-501							
C10	2000									
C11	2000		C-499	BPD-002	DD-202	K072	801-002	DC-522	5HK-D2	
C12	2000		C-499	BPD-002	DD-202	K072	801-002	DC-522	5HK-D2	
C13	2000		C-499	BPD-002	DD-202	K072	801-002	DC-522	5HK-D2	
C14	2000		C-499	BPD-002	DD-202	K072	801-002	DC-522	5HK-D2	
C15	2000		C-499	BPD-002	DD-202	K072	801-002	DC-522	5HK-D2	
C16	2000		C-499	BPD-002	DD-202	K072	801-002	DC-522	5HK-D2	
C17	2000		C-499	BPD-002	DD-202	K072	801-002	DC-522	5HK-D2	
C18	220		C-544	NP0-SI220	TCZ-221	TZ38	NP0-335-221		5TCC-T22	
C19	2000		C-499	BPD-002	DD-202	K072	801-002	DC-522	5HK-D2	
C20	.1	200	C-543	P288N-1	DF-104	CUB2P1		PT401	2TM-P1	
C21	4000		C-516	BPD-004	DD-402	K078	811-004	UC-5240	5HK-D4	
C22	4000		C-516	BPD-004	DD-402	K078	811-004	UC-5240	5HK-D4	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	GRANCO PART No.	IRC PART No.	
R1	470KΩ	½	R-486	BTS-470K	
R2	10KΩ	½	R-490	BTS-10K	
R3	2200Ω	½	R-487	BTS-2200	
R4	330Ω	½	R-494	BTS-330	
R5	220KΩ	½	R-491	BTS-220K	
R6	330Ω	½	R-494	BTS-330	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	GRANCO PART No.	IRC PART No.	
R7	100KΩ	½	R-493	BTS-100K	
R8	330Ω	½	R-494	BTS-330	
R9	22KΩ	½	R-497	BTS-22K	
R10	22KΩ	½	R-497	BTS-22K	
R11	900Ω	4	R-488	1 3/4A-900	

TRANSFORMER (POWER)

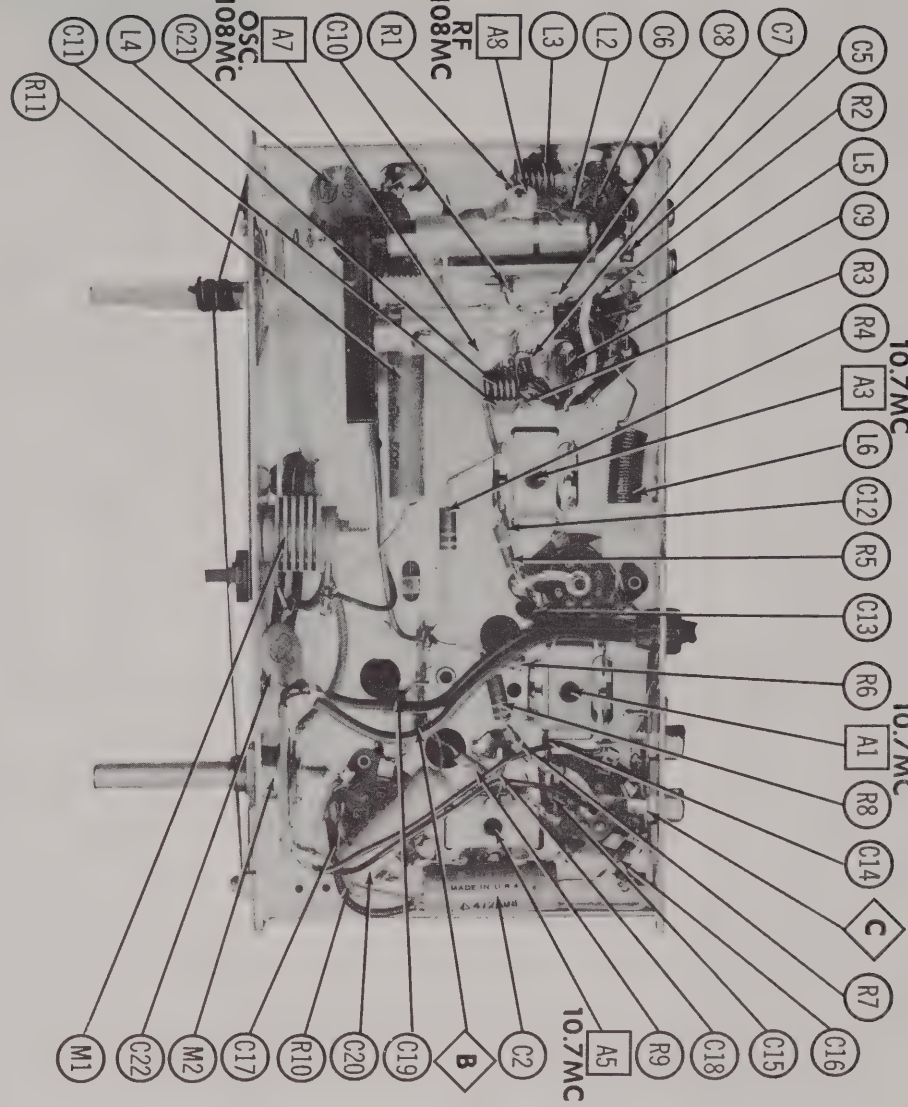
ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	GRANCO PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @ .32A	122VAC .051ADC tap @ 6.3VAC @ 1.42A			BT-545C T-545 ①					

① Alternate power transformer.

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	GRANCO PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	FM Ant. Coil	0Ω		L-477				
L2	RF Coil	.1Ω		L-141	19-1002		4606	2.9 Microhenries
L3	FM RF Coil	0Ω		L-455				
L4	FM Osc. Coil	0Ω		L-456				
L5	Cathode Choke	.1Ω		L-141	19-1002		4606	2.9 Microhenries
L6	Fil. Choke	0Ω		L-526	19-1002		4606	2 Microhenries
L7	1st. FM IF	1.6Ω	1.5Ω	L-472	16-3487	FM-254	1463	
L8	2nd. FM IF	1.6Ω	1.5Ω	L-472	16-3487	FM-254	1463	
L9	Ratio Det.	1.6Ω	.9ΩCT	L-473	17-3498	FM-255	1465	Tertiary winding -.4Ω

CHASSIS—BOTTOM VIEW



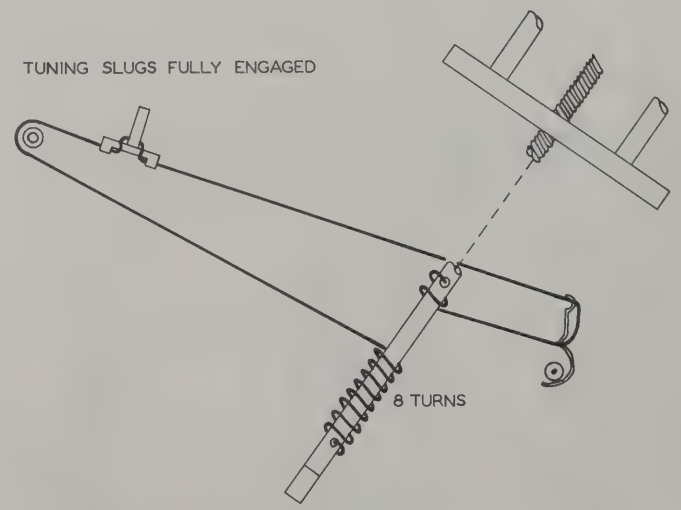
PARTS LIST AND DESCRIPTIONS (Continued)

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA						NOTES
	CURRENT	GRANCO PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	
M1	.051ADC	B-538	1263A	RS065	65	8J1	65	

MISCELLANEOUS

ITEM No.	PART NAME	GRANCO PART No.	NOTES
M2	Switch	O-536	Radio-phono (2 pole-2 position)
	Cabinet	E-460W	Walnut
	Cabinet	E-460B	Sandtone
	Knob	K-478	Tuning & radio-phono switch
	Dial Pointer	M-470	



DIAL CORD STRINGING

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1.	.01MFD	High side to pin 7 (grid) of 12AT7 (V2). Low side to chassis.	10.7MC (Unmod)	Point of non-interference	DC probe to point (A). Common to chassis.	A1, A2, A3, A4, A5	Adjust for maximum deflection.
2.	"	"	"	"	DC probe to point (B). Common to point (A).	A6	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60% modulation and 450KC sweep. Use 120% sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
1.	.01MFD	High side to pin 7 (grid) of 12AT7 (V2). Low side to chassis.	10.7MC (450KC Swp)	Point of non-interference	Vert. Amp. to point (A). Low side to chassis.	A1, A2, A3, A4, A5	Disconnect stabilizing capacitor C2. Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
2.	"	"	"	"	Vert. Amp. to point (C). Low side to chassis.	A6	Reconnect stabilizing capacitor C2. Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A5 for maximum amplitude and straightness of crossover lines.

RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
3.	270Ω Carbon Resistor	High side thru 270Ω to antenna terminal. Low side to chassis.	108MC	Tuning shaft fully clockwise	DC probe to point (A). Common to chassis.	A7, A8	Adjust for maximum deflection.
4.	"	"	88MC	Tuning shaft fully counter clockwise	"	L3, L4	Expand or compress L3 and L4 for maximum deflection.

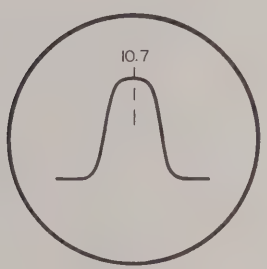


FIG. 1

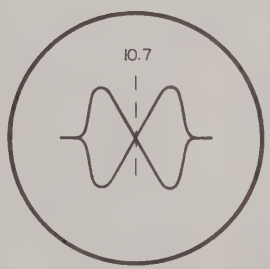
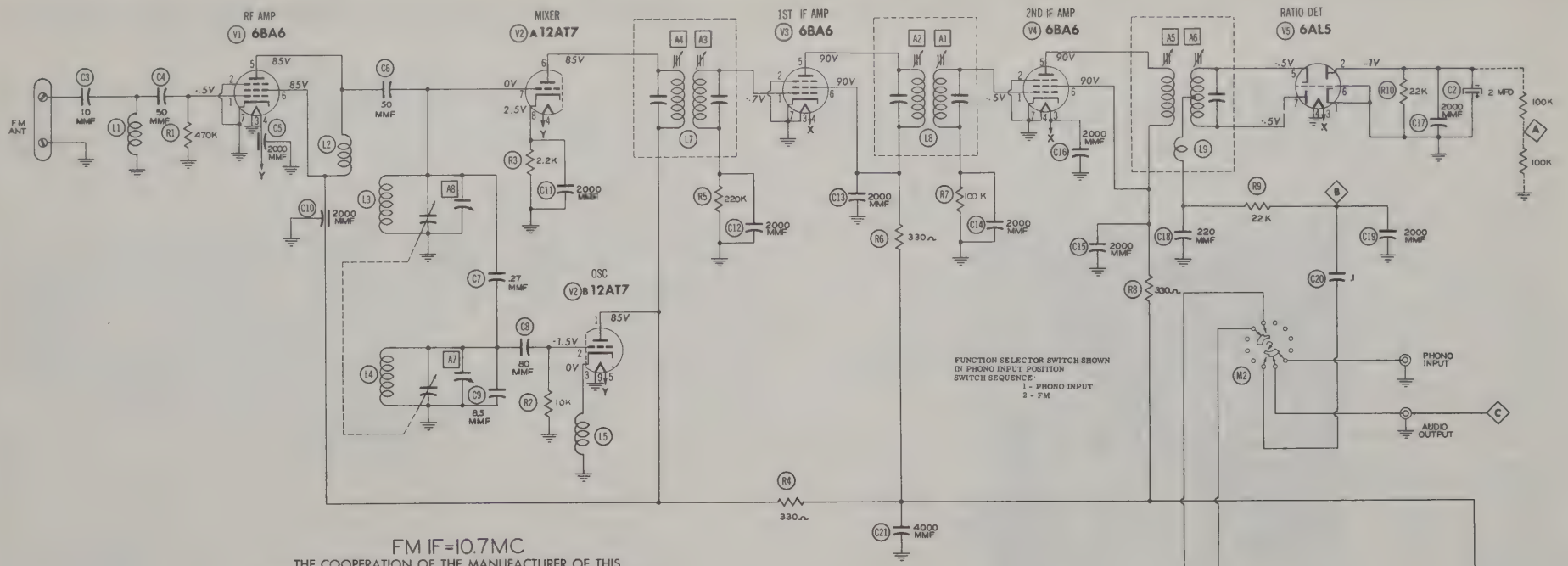


FIG. 2



FM IF=10.7MC

THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BA6	470KΩ	0Ω	0Ω	.1Ω	†1.2KΩ	†1.2KΩ	0Ω		
V 2	12AT7	†1.2KΩ	10KΩ	.2Ω	.1Ω	.1Ω	†1.2KΩ	0Ω	2.2KΩ	0Ω
V 3	6BA6	220KΩ	0Ω	0Ω	.1Ω	†1.2KΩ	†1.2KΩ	0Ω		
V 4	6BA6	100KΩ	0Ω	.1Ω	0Ω	†1.2KΩ	†1.2KΩ	0Ω		
V 5	6AL5	0Ω	22KΩ	.1Ω	0Ω	INF	0Ω	INF		

ALL MEASUREMENTS TAKEN IN FM POSITION.
† MEASURED FROM OUTPUT OF M1.

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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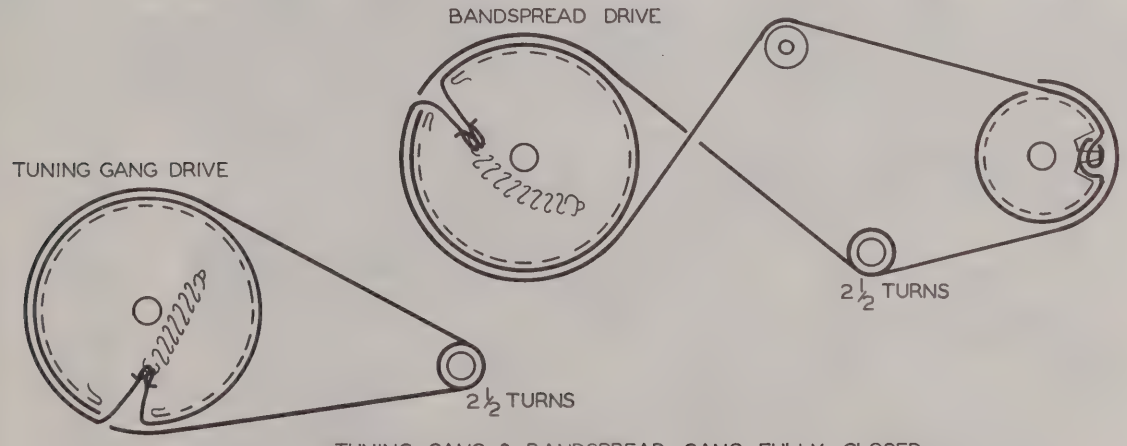
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

TRADE NAME	Hallicrafters Models SX-99, SX-99U (Ch. MARK I)
MANUFACTURER	Hallicrafters Co., 4401 W. 5th. St., Chicago 24, Ill.
TYPE SET	AC Operated 4 Band AM Superheterodyne Communications Receiver
TUBES (Eight)	Types: 6SG7 RF Amp., 6SA7 Converter, 6SG7 1st. IF Amp., 6SK7 2nd. IF Amp., 6H6 Det.-AVC-Noise Limiter, 6SC7 AF Amp. -Beat Freq.Osc., 6K6GT Output, 5Y3GT Rectifier
POWER SUPPLY	105-125 Volts AC-50-60 Cycles (Model SX-99) 100-250 Volts AC -25-60 Cycles (Model SX-99U)
RATING	.57 Amp. @ 117 Volts AC-60 Cycles
TUNING RANGES	Band 1 - 538-1600KC Band 2 - 1.55-4.6MC Band 3 - 4.6-13MC Band 4 - 12-34MC Bandspread on 80, 40, 20, 15 and 11-10 Meters



TUNING GANG & BANDSPREAD GANG FULLY CLOSED

DIAL CORD STRINGING

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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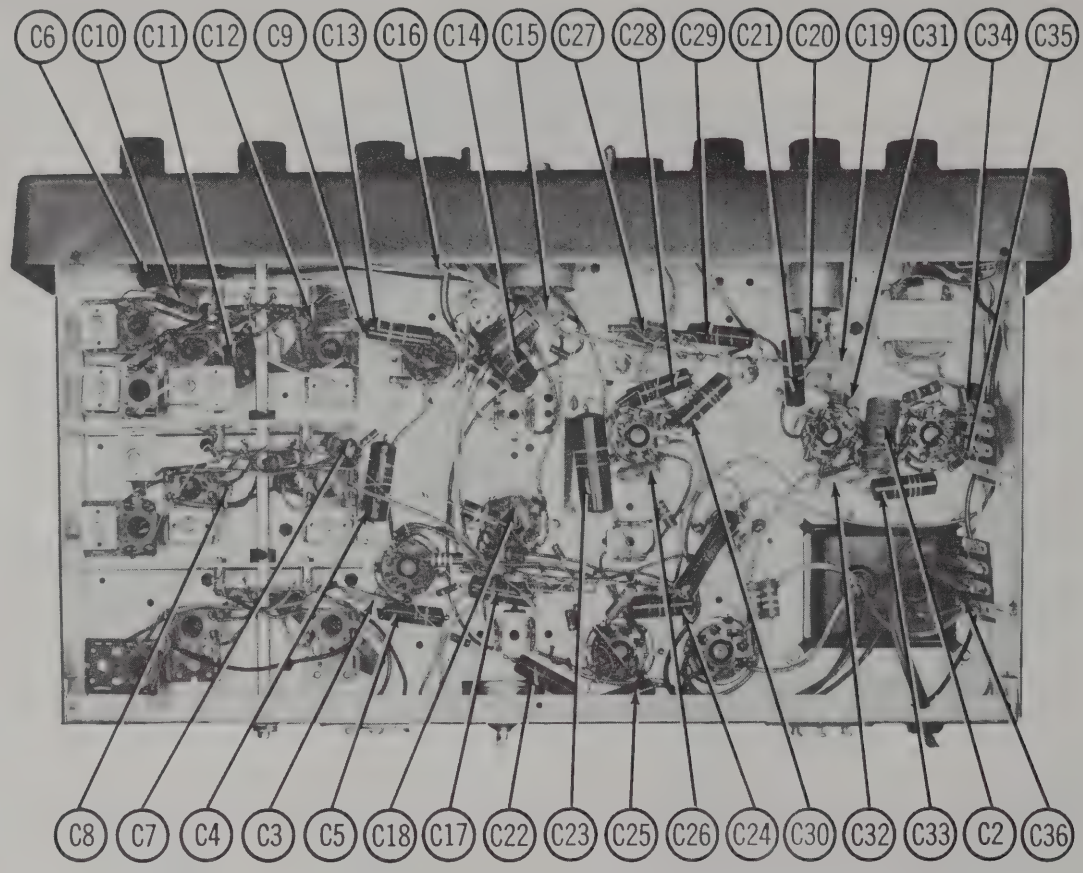
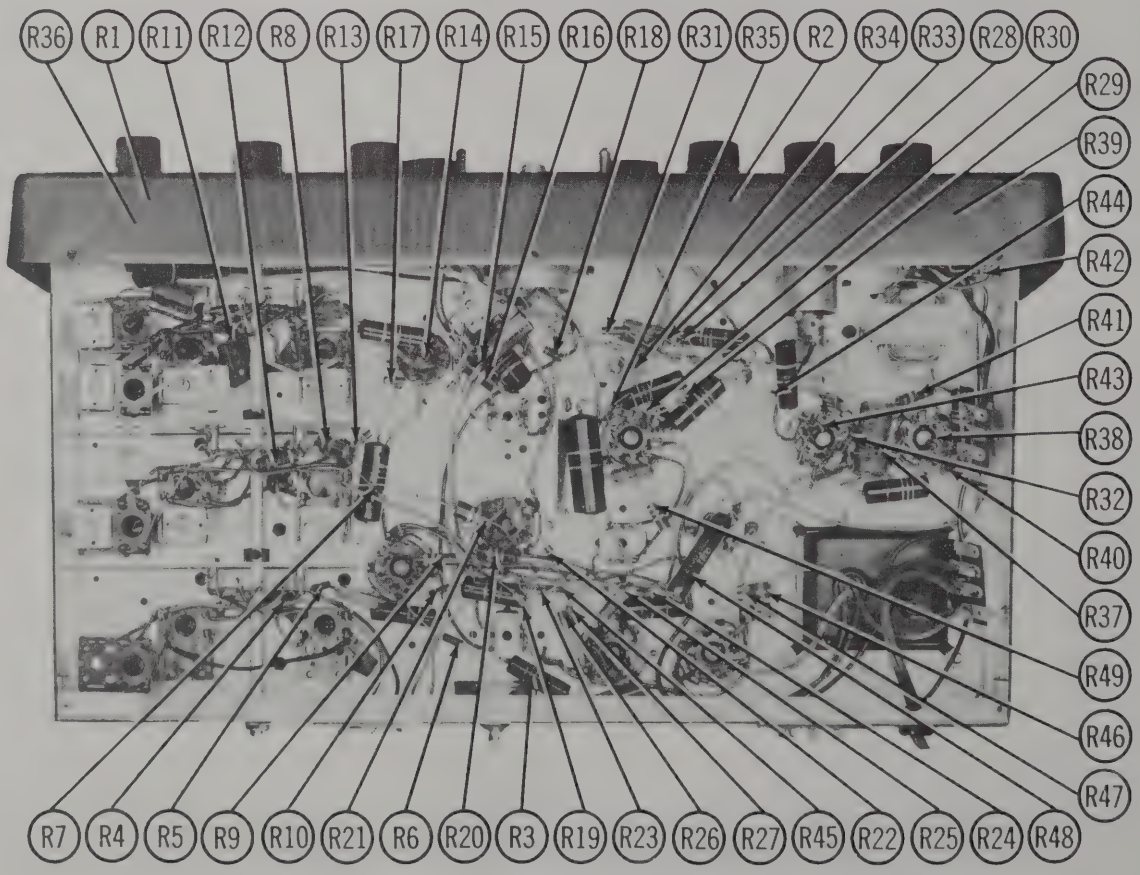
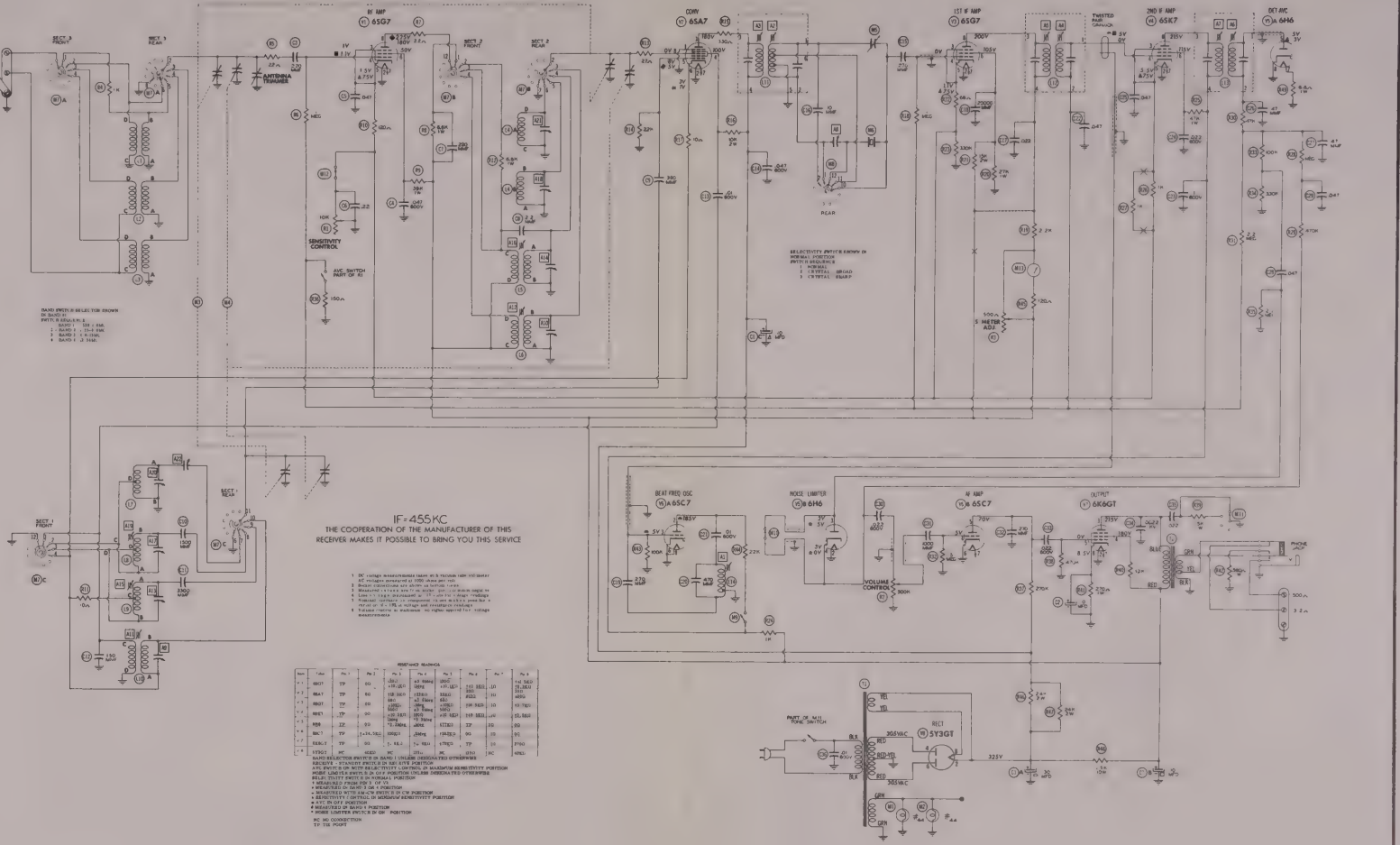


CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION


IF=455KC
THE COOPERATION OF THE MANUFACTURER OF THIS
RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
RF AMP
CONV
1ST IF AMP
2ND IF AMP
DET AVC
BEAT FREQ OSC
NOISE LIMITER
AF AMP
OUTPUT
SECT 3 FRONT
SECT 3 REAR
SECT 2 FRONT
SECT 2 REAR
SECT 1 FRONT
SECT 1 REAR
ANTENNA TRIMMER
SENSITIVITY CONTROL
AVC SWITCH PART OF R1
VOLUME CONTROL
S METER ADJ
TONE SWITCH
RECT
PHONE JACK
RESISTANCE READINGS
A PHOTOFACT STANDARD NOTATION SCHEMATIC
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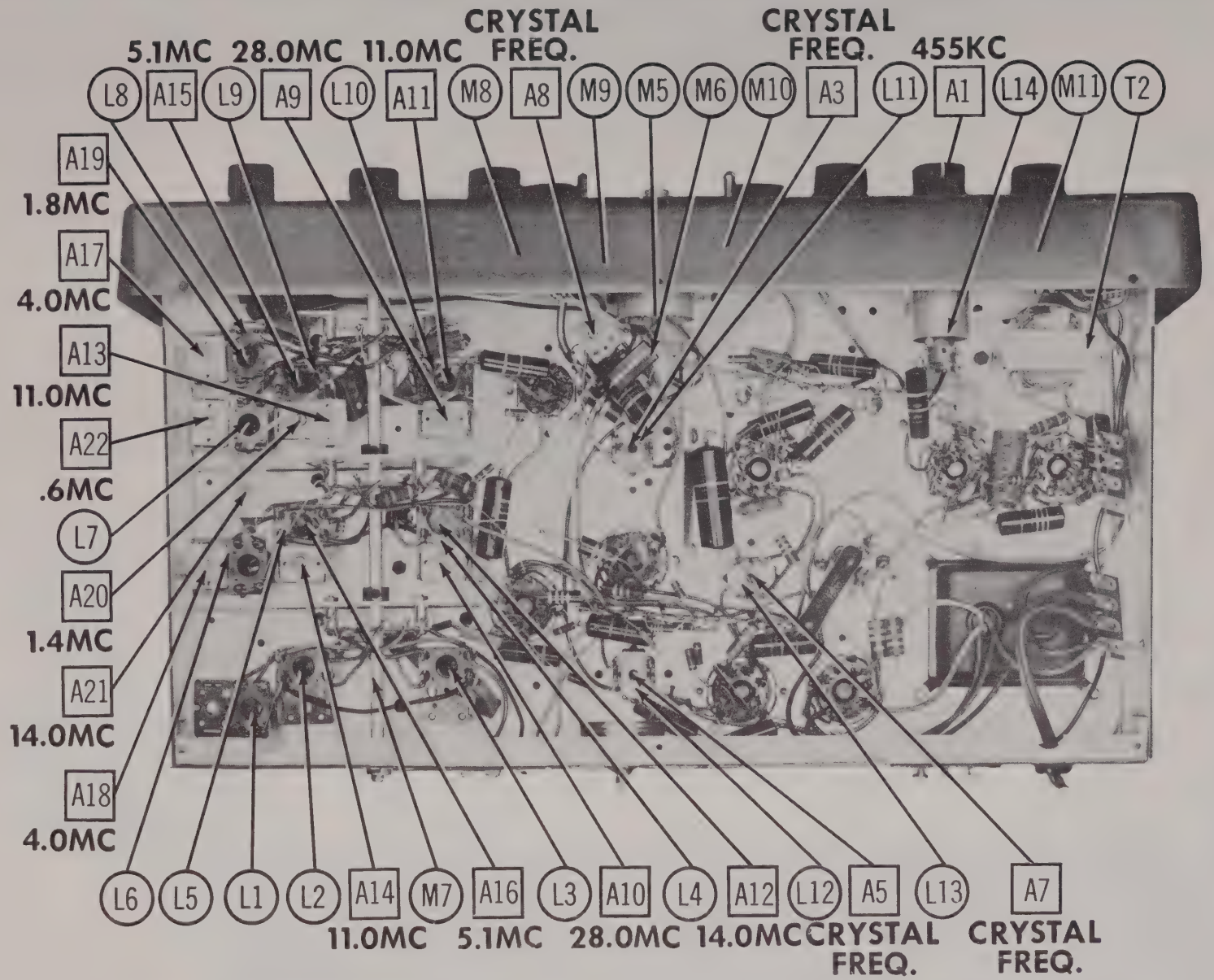
309-9



CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Sensitivity control - to maximum, but with AVC "off".
Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Noise Limiter - "Off" , Standby-Receive - "Receive ", Tone -'High"

AM AND SW IF ALIGNMENT

* The crystal filter IF transformer secondary winding (A2) has been preset to crystal frequency at factory.
Use only a signal generator which may accurately be set to obtain .25KC of any frequency between 450KC and 460KC .
Do not attempt to make this adjustment if a standard type signal generator is used. Start with step 3.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
*1.	.02MFD	High side to stator of middle section of main tuning gang.	455KC (Unmod)	2	Tuning gang at 50 on logging scale. Bandspread at 30.	500Ω speaker terminal to chassis.	A1 (BFO slug)	Selectivity switch at "Broad" crystal. Reception switch at "CW". Remove "Pitch" control knob and adjust shaft for zero beat. Do not replace knob.
*2.	"	"	455KC (Approx.) (Unmod)	"	"	"	A2	Adjust "pitch" for a 400 - 1000Ω note. Rock signal generator while turning A2 in one direction. As the adjustment is made, the output goes thru a maximum, dips down and goes up again. The correct setting of A2 is at the center of the dip.
3.	"	"	Crystal frequency	"	"	"	Signal Gen.	Selectivity switch at "sharp crystal". Adjust generator frequency for maximum output. This will be the exact frequency of the crystal. A slight reduction will be noted when switching from "Broad" to "sharp" crystal.
4.	"	"	"	"	"	"	A1	Selectivity switch at "broad" crystal. Rotate "pitch" control shaft until a zero beat is obtained. Replace knob with zero in line with panel index mark.
5.	"	"	Crystal frequency (Mod)	"	"	"	A3, A4, A5, A6, A7, A8	Selectivity switch at "normal". Reception switch at "AM". Adjust for maximum output. Repeat for maximum gain.

AM AND SW RF ALIGNMENT

Selectivity Switch to "Normal". Reception Switch to "AM." Bandspread dial to "30" on outer band (10M).

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
6.	Fig. 1	High side to antenna terminal "A1". Low side to chassis.	28.0MC	4	28.0MC	Across 500Ω speaker terminal and chassis.	A9, A10	Adjust for maximum output.
7.	"	"	14.0MC	"	14.0MC	"	A11, A12	"
8.	"	"	11.0MC	3	11.0MC	"	A13, A14	"
9.	"	"	5.1MC	"	5.1MC	"	A15, A16	"
10.	"	"	4.0MC	2	4.0MC	"	A17, A18	"
11.	"	"	1.8MC	"	1.8MC	"	A19	"
12.	"	"	1.4MC	1	1.4MC	"	A20, A21	"
13.	"	"	0.6MC	"	0.6MC	"	A22	"

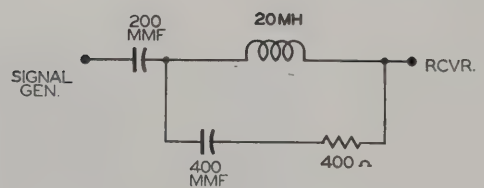


FIG. 1

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		Hallicrafters PART No.	STANDARD REPLACEMENT		
V1	RF Amplifier	6SG7	6SG7	8BK	
V2	Converter	6SA7	6SA7	8R	
V3	1st. IF Amp.	6SG7	6SG7	8BK	
V4	2nd. IF Amp.	6SK7	6SK7	8N	
V5	Det-AVC-Noise Limiter	6H6	6H6	7Q	
V6	AF Amplifier-Beat Freq. Osc.	6SC7	6SC7	8S	
V7	Audio Output	6K6GT	6K6GT	7S	
V8	Rectifier	5Y3GT	5Y3GT	5T	

ELECTROLYTIC CAPACITORS

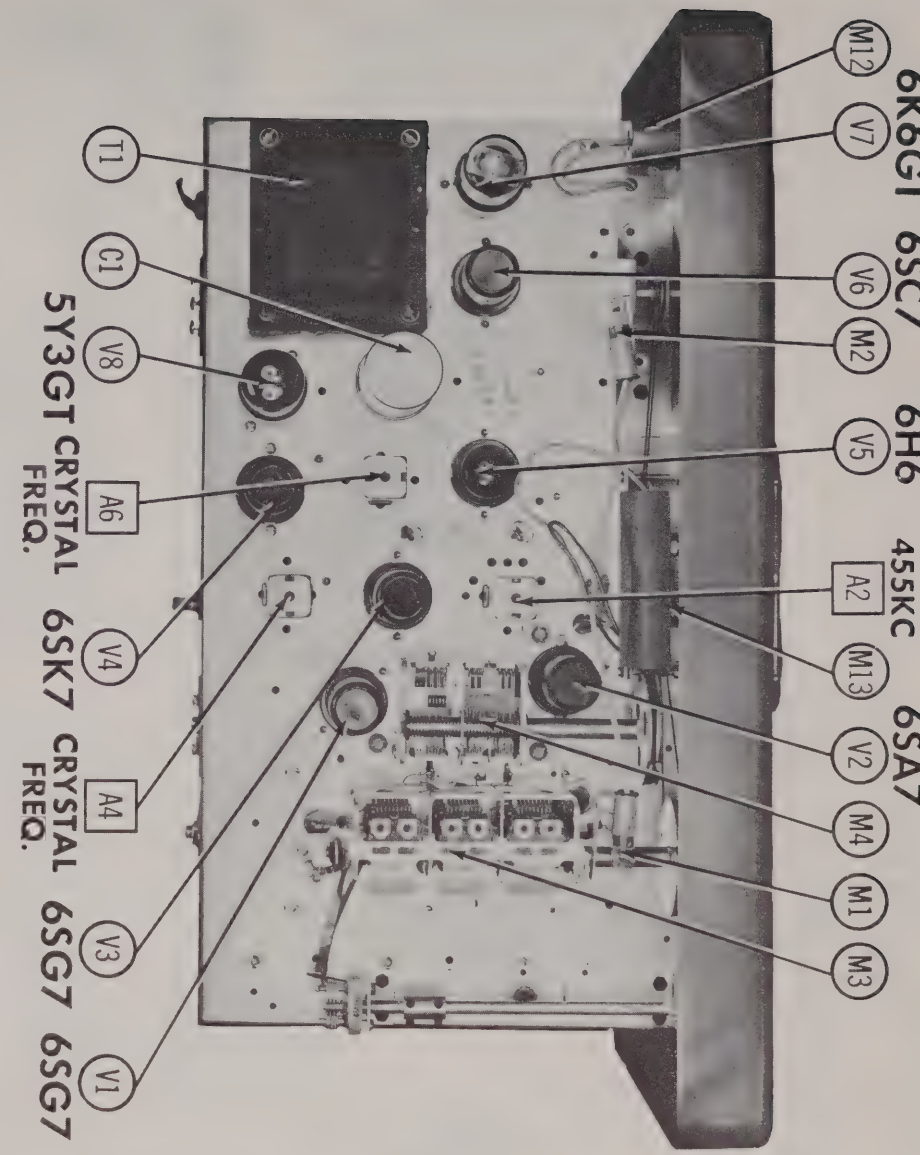
ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	Hallicrafters PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲30	450	45A062	AFH3-41	C032	FP376.6	TM-401010-450	Q-035	TVL-3772
B	■10	450							
C	▲10	450							
C2	10	25	45A121	PRS25V10	BR102	TC22	TD-10-25	FM-0210	TVA-1204

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	Hallicrafters PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3	220	500	47X20B271K	NP0-SI220	TCZ-220	5R5T22	NP0-335-221		MS-322	
C4	.047	600	46BR473L6	BPD-05	DF-503	CUB6S47		PT6147	6TM-S47	
C5	.047	200	46BR473L2	BPD-05	DF-503	CUB2S47		PT4147	2TM-S47	
C6	.22	200	46BR224L2	P288N-22		CUB2P22		PT4022	2TM-P22	
C7	220	500	47X20B271K	NP0-SI220	TCZ-220	5R5T22	NP0-335-221	MCE240	MS-322	
C8	2.2		47A160-4	NP0-SI2.2	TCZ-2R2	TZ05	NP0A-2R2		5TCCB-V22	
C9	390	500	47X20B391K	1469-00039	D6-391	5R5T39	811-391	MCB243	MS-339	
C10	1500	500	47X30C152G	1464-0015		1R5D15	811-152	MCE256	MS-215	
C11	3300	500	47X30C332J	1464-0033		1R5D33			MS-233	
C12	150	500	47X20C151J	NP0-SI150	TCZ-150	5R5T15	NP0-334-151	MCE-236	MS-315	
C13	.01	600	46BR103L6	BPD-01	D6-103	CUB6S1	GP3-333-103	PT611	6TM-S1	
C14	.047	600	46BR473L6	BPD-05	DF-503	CUB6S47		PT6147	6TM-S47	
C15	270	500	47X20B271K	NP0-SI270	TCZ-270	5R5T27	NP0-335-271	MCE241	MS-327	
C16	10	-	47X20UK100K	NP0-SI10	TCZ-10	TZ09	NP0A-100	ZT-541	5TCC-Q1	
C17	.022	200	46BR223L6	BPD-02	DD-203	CUB2S22	817-02	PT4122	2TM-S22	
C18	20000		47A242	BPD-02	DD-203	K085	817-02		5HK-S2	
C19	270	500	47X20B271K	NP0-SI270	TCZ-270	5R5T27	NP0-335-271	MCE241	MS-327	
C20	470	500	47X20BR471J	1469-00047		5R5T47		MCE245	MS-347	
C21	.01	600	46BR103L6	BPD-01	D6-103	CUB6S1	GP3-333-103	PT611	6TM-S1	
C22	.047	200	46BR473L2	BPD-05	DF-503	CUB2S47		PT4147	2TM-S47	
C23	.1	600	46BR104L6	P688N-1	DF-104	CUB6P1		PT601	6TM-P1	
C24	.022	600	46BR223L6	BPD-02	DD-203	CUB6S22	817-02	PT6122	6TM-S22	
C25	.047	200	46BR473L2	BPD-05	DF-503	CUB2S47		PT4147	2TM-S47	
C26	47	500	47X20B470M	NP0-SI47	TCZ-47	5R5Q47	NP0-338-470	ZT-5447	MS-447	
C27	47	500	47X20B470M	NP0-SI47	TCZ-47	5R5Q47	NP0-338-470	ZT-5447	MS-447	
C28	.047	200	46BR473L2	BPD-05	DF-503	CUB2S47		PT4147	2TM-S47	
C29	.047	200	46BR473L2	BPD-05	DF-503	CUB2S47		PT4147	2TM-S47	
C30	.022	600	46BR223L6	BPD-02	DD-203	CUB6S22	817-02	PT6122	6TM-S22	
C31	1000	500	47X25B102M	SI1000	D6-102	1W5D1	GP2L-102	MC255	1FM-21	
C32	270	500	47X20B271K	NP0-SI270	TCZ-270	5R5T27	NP0-335-271	MCE241	MS-327	
C33	.022	600	46BR223L6	BPD-02	DD-203	CUB6S22	817-02	PT6122	6TM-S22	
C34	.0022	1000	46BR222L10	HVD-15-2200	DD-222	CUB16D22		PT16222	10TM-D22	
C35	.022	600	46BR223L6	BPD-02	DD-203	CUB6S22	817-02	PT6122	6TM-S22	
C36	.01	600	46BR103L6	BPD-01	D6-103	CUB6S1	GP3-333-103	PT611	6TM-S1	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	Hallicrafters PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1	10KΩ	½	25B607					Sensitivity & switch
R2A	500KΩ	½	25A543	AB-60	A47-500K-Z	Q13-133	U-48	Volume
B	Shaft		Not Req.	AK-9	RS-2	Not Req.	Not Req.	Attach to R2A
R3	500Ω	½	25C022			4WK-750R		"S" Meter adjustment - wirewound.

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	Hallicrafters PART No.	IRC PART No.	
R4	1000Ω	½	23X20X102K	BTS-1000	
R5	22Ω	½	23X20X220K	BTS-22	
R6	1Meg	½	23X20X105K	BTS-1Meg	
R7	22Ω	2	23X20X220K	BTS-22	
R8	6800Ω	1	23X30X682K	BTA-6800	
R9	39KΩ	1	23X30X393K	BTA-39K	
R10	120Ω	½	23X20X121K	BTS-120	
R11	10Ω	½	23X20X100K	BTS-10	
R12	6800Ω	1	23X30X682K	BTA-6800	
R13	27Ω	½	23X20X270K	BTS-27	
R14	22KΩ	½	23X20X223K	BTS-22K	
R15	330Ω	½	23X20X331K	BTS-330	
R16	10KΩ	2	23X40X103K	BTB-10K	
R17	10Ω	½	23X20X100K	BTS-10	
R18	1Meg	½	23X20X105K	BTS-1Meg	
R19	2200Ω	2	23X20X222K	BTS-2200	
R20	27KΩ	1	23X30X273K	BTA-27K	
R21	15KΩ	2	23X40X153K	BTB-15K	
R22	68Ω	½	23X20X680K	BTS-68	
R23	330KΩ	½	23X20X334K	BTS-330K	
R24	1000Ω	½	23X20X102K	BTS-1000	
R25	47KΩ	1	23X30X473K	BTA-47K	
R26	1000Ω	½	23X20X102K	BTS-1000	Note 1

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	Hallicrafters PART No.	IRC PART No.	
R27	1000Ω	½	23X20X102K	BTS-1000	Note 2
R28	1Meg	½	23X20X105K	BTS-1Meg	
R29	470KΩ	½	23X20X474K	BTS-470K	
R30	47KΩ	½	23X20X473K	BTS-47K	
R31	2.2Meg	½	23X20X225K	BTS-2.2Meg	
R32	15Meg	½	23X20X156K	BTS-15Meg	
R33	100KΩ	½	23X20X104K	BTS-100K	
R34	330KΩ	½	23X20X334K	BTS-330K	
R35	2.2Meg	½	23X20X225K	BTS-2.2Meg	
R36	150Ω	½	23X20X151K	BTS-150	
R37	270KΩ	½	23X20X274K	BTS-270K	
R38	470KΩ	½	23X20X474K	BTS-470K	
R39	15KΩ	1	23X30X153K	BTA-15K	
R40	10KΩ	½	23X20X103K	BTS-10K	
R41	270Ω	1	23X30X271K	BTA-270	
R42	560Ω	1	23X30X561K	BTA-560	
R43	100KΩ	½	23X20X104K	BTS-100K	
R44	22KΩ	½	23X20X223K	BTS-22K	
R45	120Ω	½	23X20X121K	BTS-120	
R46	24KΩ 5%	2	23X40X243J	BTB-24K 5%	
R47	24KΩ 5%	2	23X40X243J	BTB-24K 5%	
R48	1500Ω	10	24BG152E	1 3/4A-1500	
R49	6.8Ω	1	23X30X068K		

Note 1. Some versions may use 500Ω in this application.
Note 2. When R26 is 500, R27 is not used.

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	Hallicrafters PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @ .57A	610VCT .073ADC	5VAC @ 2A	6.3VAC @ 2.67A	52A209 52A210 ①	P9313 ②	P-2951 ② ③		22R05 ②	R-9B ② ③

① Power transformer used in model SX-99U
② Tape 6.3V center tap.
③ Drill new mounting holes.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	Hallicrafters PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	6.9KΩ	500Ω tap @ 3.2Ω	52B265						

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	Hallicrafters PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	BC & SW Ant. Coils	1.6Ω	5.5Ω	51B1937				Bands 1 and 2
L2	SW Ant. Coil	.3Ω	.1Ω	51B1938				Band 3
L3	SW Ant. Coil	.1Ω	0Ω	51B1939				Band 4
L4A	BC RF Coil	1.6Ω	5.5Ω	51B1904				Bands 1 and 2 Trimmer included
B	SW RF Coil	5.5Ω						Trimmer included
L5	SW RF Coil	8Ω	.1Ω	51B1906				Band 3 Trimmer included
L6	SW RF Coil	1.4Ω	0Ω	51B1905				Band 4 Trimmer included
L7	BC Osc. Coil	3.2Ω		51B1897				Band 1 - tapped - @ .4Ω-trimmer included
L8	SW Osc. Coil	1.5Ω		51B1898				Band 2- tapped @ .2Ω-trimmer included
L9	SW Osc. Coil	0Ω		51B1899				Band 3-tapped - trimmer included
L10	SW Osc. Coil	0Ω	0Ω	51B1900				Band 4
L11	1st. IF Trans.	12Ω	12.5Ω*	50C656				
L12	2nd. IF Trans.	12Ω	12Ω	50C657	16-6758	BC-353	12-C2	
L13	3rd. IF Trans.	16Ω	16Ω	50C242	16-6758	BC-353	12-C2	
L14	BFO Coil	16Ω		54B051				Tapped @ 11Ω

* Tapped @ 10.5Ω and 9.5Ω.

MISCELLANEOUS

ITEM No.	PART NAME	Hallicrafters PART No.	NOTES
M1	Dial Light	39A003	#44
M2	Dial Light	39A003	#44
M3	Tuning Cap.	48C341	3 Gang (14-410MMF, 14-410MMF, 14-410MMF)
M4	Tuning Cap.	48C342	Bandspread 3 gang (6-34MMF, 6-34MMF, 6-34MMF)
M5	Variable Cap.	48A351	Crystal Phasing (3-25MMF)
M6	Crystal	19A123	Selectivity
M7A	Switch	60B389	Band selector - antenna stage (Rotary-wafer type)
B	Switch	62B039	Band selector - RF stage (Rotary-wafer type)
C	Switch	62B044	Band selector - Osc. stage (Rotary-wafer type)
M8	Switch	60B681	Selectivity (Rotary-wafer type)
M9	Switch	60A138	AM-CW (SPST-Toggle)
M10	Switch	60A689	Noise Limiter (SPST-Toggle)
M11	Switch	60A225	Power (off) & tone (Rotary-wafer type)
M12	Switch	60B682	Receive - standby (SPST-Rotary)
M13	Meter	82D283	Carrier level indicator
	Trimmer Cap.	44A047	Crystal trimmer (2-30MMF)
	Trimmer Cap.	44A149	Osc. (4-70MMF), Band 4 (12- 34MC)
	Trimmer Cap.	44A148	Osc. (2-30MMF), Band 3 (4.6-13MC)
	Trimmer Cap.	44A148	Osc. (2-30MMF), Band 2 (1.55-4.6MC)
	Trimmer Cap.	44A191	Osc. (2-20MMF), Band 1 (.538-1.6MC)
	Padder Cap.	44A394	Osc. (320-520MMF), Band 1 (.538-1.6MC)
	Trimmer Cap.	44A395	RF (4-80MMF), Band 4 (12-34MC)
	Trimmer Cap.	44A396	RF (3-30MMF), Band 3 (4.6-13MC)
	Trimmer Cap.	44B147	RF (1.5-15MMF), Band 2 (1.55-4.6MC)
	Trimmer Cap.	44A191	RF (2-20MMF), Band 1 (.538-1.6MC)
	Trimmer Cap.	48A182	Ant. (3-25MMF), All bands
	Knob	15B791	Band selector, selectivity, power off, tone, sensitivity and volume
	Knob	15B788	Pitch
	Knob	15B835	Standby - receive , crystal phasing & ant. trimmer
	Knob	15B802	Tuning & bandspread
	Dial	83D489	Bandspread
	Dial	83D488	Tuning
	Window	22B432	Bandspread
	Window	22B427	Tuning dial

PROPERTY OF
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DENVER, COLORADO

RETMA MEMBER

MAGNAVOX CHASSIS AMP-137AB

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

MAGNAVOX
CHASSIS AMP-137AB

MAGNAVOX
CHASSIS AMP-137AB

TRADE NAME	Magnavox Chassis AMP-137AB
MANUFACTURER	Magnavox Co., 2131 Bueter Road, Fort Wayne, Indiana
TYPE SET	Externally powered 4 channel Audio Control Amplifier
TUBES (Two)	Types: 6AV6 Preamp., 6AV6 AF Amp.

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PARTS LIST AND DESCRIPTIONS

MAGNAVOX
Chassis AMP-137AB

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		MAGNAVOX PART No.	STANDARD REPLACEMENT		
V1	Preamplifier	6AV6	6AV6	7BT	
V2	AF Amplifier	6AV6	6AV6	7BT	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	MAGNAVOX PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	■20	350	270023-19	AFH3-103	[A046	[FP231	[TM-20-400	D-320	TVL-3633
B	▲30	25			BR502	TC36	TD-50-25		

FIXED CAPACITORS

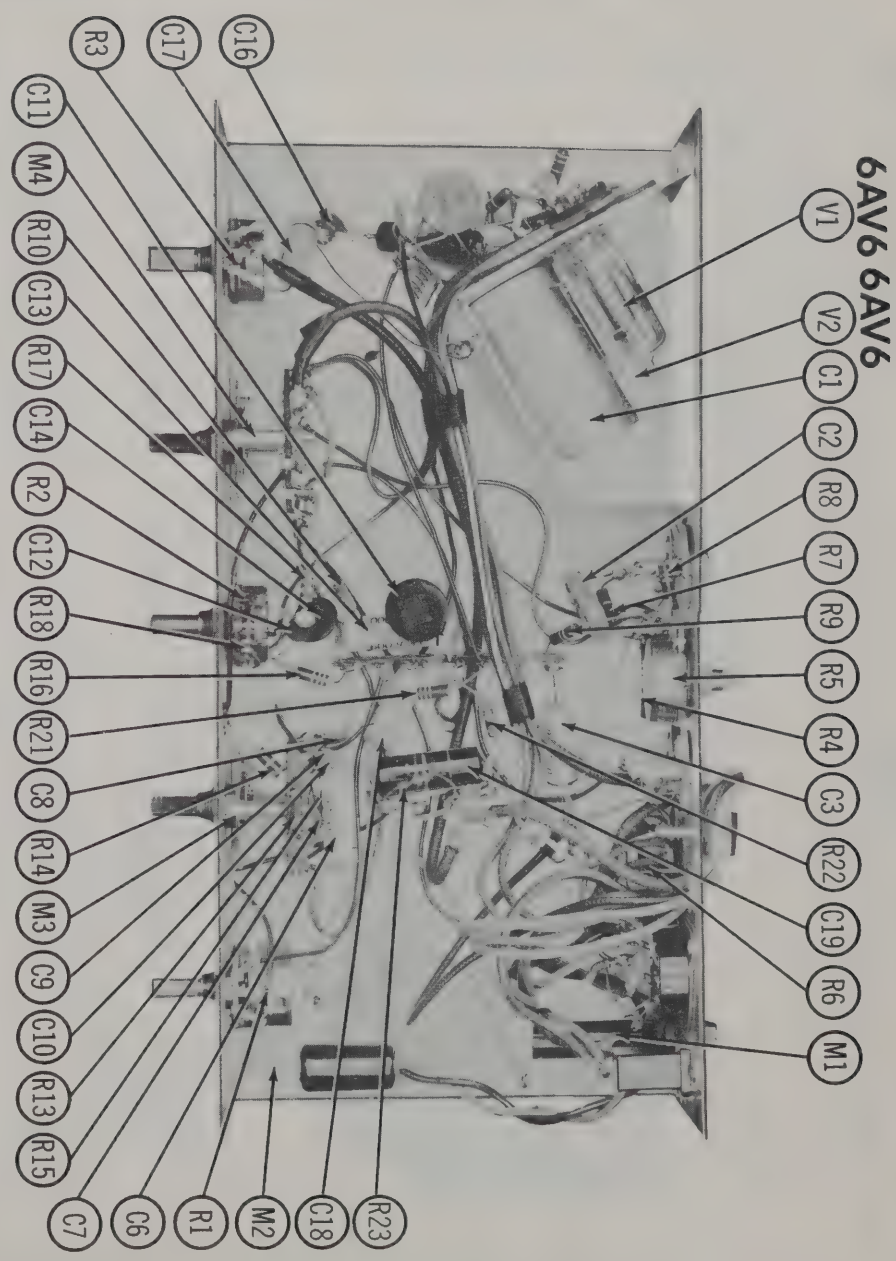
Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	MAGNAVOX PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	330	500	250159-88	1469-00033	D6-331	5R5T33	811-331		MS-333	
C3	.0015	600	250201-2	SI1500	D6-152	CUB6D15	GP2L-152	PT6215	6TM-D15	
C4	220		250218-5	BPD-00022	DD-221	G051	811-221	UC-5322	5GA-T22	
C5	10000		250175-2	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C6	.0015	600	250201-2	SI1500	D6-152	CUB6D15	GP2L-152	PT6215	6TM-D15	
C7	220		250218-5	BPD-00022	DD-221	G051	811-221	UC-5322	5GA-T22	
C8	220		250218-5	BPD-00022	DD-221	G051	811-221	UC-5322	5GA-T22	
C9	33		250218-3	N750-DI33	TCN-33	N029	N750K-330		5TCU-Q33	
C10	68		250218-7	N750-DI68	TCN-68	N038	N750L-680		5TCU-Q68	
C11	5000		250218-13	1464-005		1R5D5		MCB465	MS-25	
C12	100		250207-15	1469-0001	D6-101	5R5T1	801-101	MCB235	MS-31	
C13	.0068	600	250201-6	SI6800	D6-682	CUB6D68	GP3-333-682		6TM-D68	
C14	1000		250218-8	1464-001		1R5D1	811-102	MCB255	MS-21	
C15	.01	600	250201-7	BPD-01	DD-103	CUB6S1	GP3-333-103	PT611	6TM-S1	
C16	220		250218-5	BPD-00022	DD-221	G051	811-221	UC-5322	5GA-T22	
C17	.0022	600	250201-3	SI2200	D6-222	CUB6D22	GP2-333-222	PT6222	6TM-D22	
C18	.0022	600	250201-3	SI2200	D6-222	CUB6D22	GP2-333-222	PT6222	6TM-D22	
C19	.022	600	250201-9	BPD-02	DD-203	CUB6S22	817-02	PT6122	6TM-S22	
C20	.015	600	25201-8	BPD-015	DD16-153	CUB6S15	817-015	PT6115	6TM-S15	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	MAGNAVOX PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	1Meg	½	220073-18	AB-70	A47-1Meg-Z	Q13-137	U-53	Bass
B	Shaft		Not Req.	AK-3	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	KB-1	SWE-12	76-1	US-26	Attach to R1A
R2A	1Meg	½	220074-1	ABT-7417	A47F3-1Meg	Q18-137X		Volume tap @ 100KΩ
B	Shaft		Not Req.	AK-3	FS-3	Not Req.		Attach to R2A
R3A	1Meg	½	220072-18	B-70	A47-1Meg-Z	Q13-137	U-53	Treble
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R3A
R4A	1.5Meg	½	220076-28	AB-742	A47-1.5Meg-S	Q11-138	U-155	Phono level
B	Shaft		Not Req.	AK-1	FKS-1/4	Not Req.	Not Req.	Attach to R4A
R5A	500KΩ	½	220076-26	AB-59	A47-500K-S	Q11-133	SU-50	Auxiliary #1 level
B	Shaft		Not Req.	AK-1	FKS-1/4	Not Req.	Not Req.	Attach to R5A
R6A	600Ω	2	220126-12	VK-128	A43-750	W-750	R750L	Hum
B	Shaft		Not Req.	Not Req.	FKS-1/4	Not Req.	Not Req.	Attach to R6A

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	MAGNAVOX PART No.	IRC PART No.	
R7	1Meg	½	230104-98	BTS-1Meg	
R8	82KΩ	½	230104-85	BTS-82K	
R9	22KΩ	½	230104-78	BTS-22K	
R10	330KΩ	½	230104-92	BTS-330K	
R11	100KΩ	½	230104-86	BTS-100K	
R12	3300Ω	½	230104-68	BTS-3300	
R13	2.2Meg	½	230104-102	BTS-2.2Meg	
R14	4.7Meg	½	230104-106	BTS-4.7Meg	
R15	1Meg	½	230104-98	BTS-1Meg	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	MAGNAVOX PART No.	IRC PART No.	
R16	33KΩ	½	230104-80	BTS-33K	
R17	470KΩ	½	230104-94	BTS-470K	
R18	470KΩ	½	230104-94	BTS-470K	
R19	100KΩ	½	230104-86	BTS-100K	
R20	2200Ω	½	230104-66	BTS-2200	
R21	47KΩ	½	230104-82	BTS-47K	
R22	10KΩ	½	230104-74	BTS-10K	
R23	100KΩ	½	230104-86	BTS-100K	
R24	22KΩ	½	230104-78	BTS-22K	

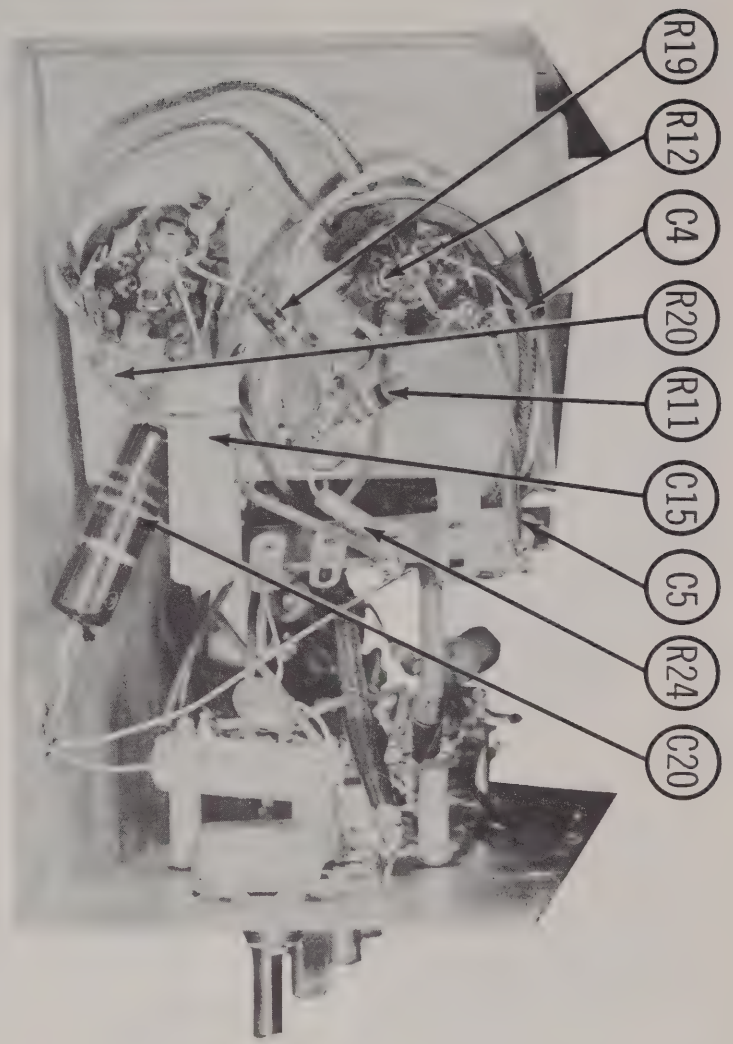
FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			MAGNAVOX PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG	5A 250V	180157-9		312005 . (3AG 5A)	341001	MTH5	HKP

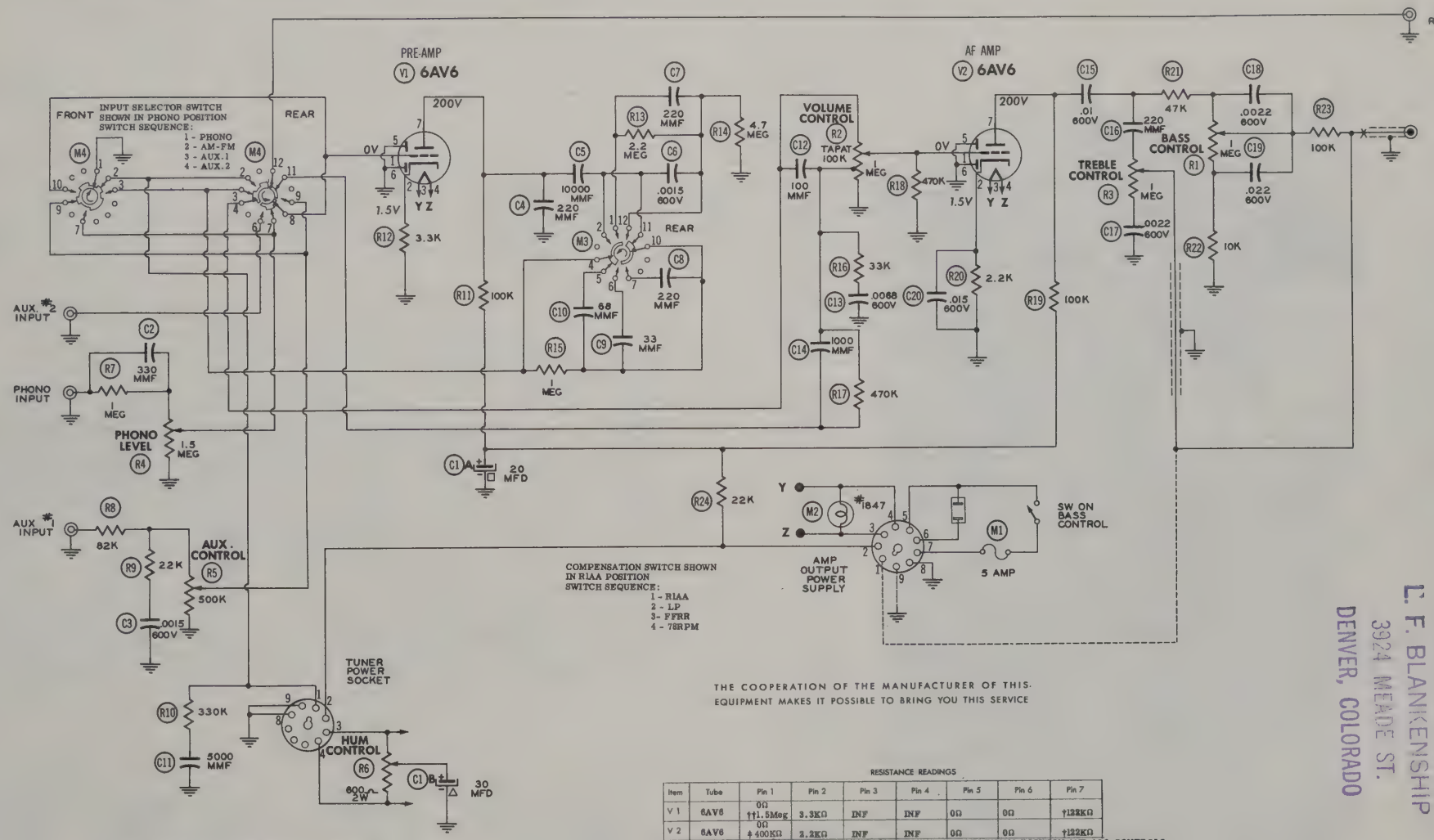
MISCELLANEOUS

ITEM No.	PART NAME	MAGNAVOX PART No.	NOTES
M2	Pilot Light		#1847
M3	Switch	160252-2	Record Compensation (Rotary-wafer type)
M4	Switch	160252-1	Selector - (Rotary-wafer type)

CHASSIS - SIDE VIEW



MAGNAVOX Chassis AMP-137AB



THE COOPERATION OF THE MANUFACTURER OF THIS EQUIPMENT MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	6AV6	0Ω ††1.5Meg	3.3KΩ	INF	INF	0Ω	0Ω	†122KΩ
V 2	6AV6	0Ω ǂ 400KΩ	2.2KΩ	INF	INF	0Ω	0Ω	†122KΩ

ALL MEASUREMENTS TAKEN WITH FUNCTION SELECTOR SWITCH IN PHONO POSITION AND ALL CONTROLS AT MAXIMUM COUNTER CLOCKWISE POSITION.
†† PHONO LEVEL CONTROL AT MAXIMUM CLOCKWISE POSITION.
ǂ VOLUME CONTROL AT MAXIMUM .
* MEASURED ACROSS FILAMENT.
† MEASURED FROM PIN 2 OF POWER PLUG.

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

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A PHOTOFACT STANDARD NOTATION SCHEMATIC
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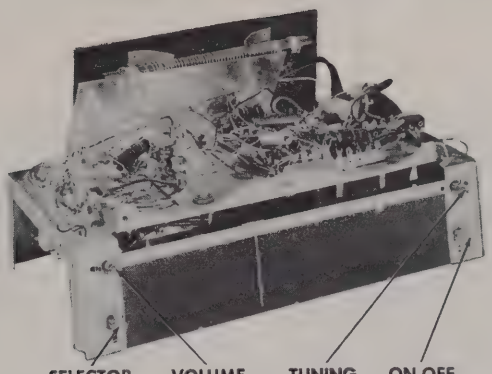

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MAGNAVOX
CHASSIS CR-703, A, B, BB

TRADE NAME	Magnavox Chassis CR-703, CR-703A, CR-703B, CR-703BB
MANUFACTURER	Magnavox Co., 2131 Bueter Rd., Fort Wayne, Ind.
TYPE SET	AC Operated AM Superheterodyne Receiver
TUBES (Eight)	Types 6BA6 RF Amp., 6BE6 Converter, 6BA6 IF Amp., 6AL5 Det.-AVC, 12AX7 AF Amp.-Phase Inverter, (2) 6V6GT Output, 5Y3GT Rectifier
POWER SUPPLY	110-120 Volts AC-50/60 Cycles — RATING .57 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	540KC-1620KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.
Set band switch to broadcast position.
Set treble control to sharp tune position.

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.01MFD	High side to pin 7 (grid) of 6BE6 (V2). Low side to chassis.	455KC (400% Mod.)	Point of non-interference (near 1000KC)	Across Voice Coil	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.	"	"	1400KC	1400KC	"	A5	"
3.		Loop	600KC	600KC	"	A6, A7	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
4.		"	1400KC	1400KC	"	A8, A9	"

AM IF ALIGNMENT USING AM SIGNAL GENERATOR AND OSCILLOSCOPE

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
1.	.01MFD	High side to pin 7 (grid) of 6BE6 (V2). Low side to chassis.	455KC (20KC Swp.)	Point of non-interference (near 1000KC)	Vert. Amp. thru 1Meg to point (A). Low side to chassis.	A1, A2, A3, A4	Set treble control to "sharp tune". Adjust for response curve of maximum peak similar to Fig. 1.
2.	"	"	"	"	"	"	Set treble control to "broad tune". Adjust for response curve of best symmetry similar to Fig. 2.

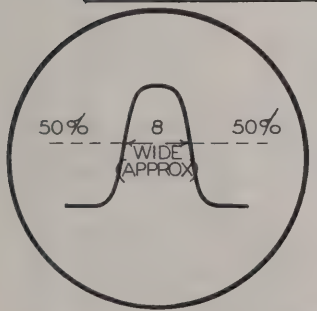

FIG. 1

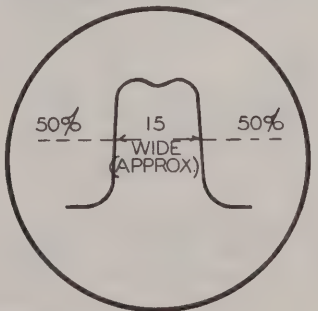

FIG. 2

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

MAGNAVOX
Chassis CR-703

ITEM No.	USE	REPLACEMENT DATA: MAGNAVOX PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	RF Amp.	6BA6	6BA6	7BK	
V2	Converter	6BE6	6BE6	7CH	
V3	IF Amp.	6BA6	6BA6	7BK	
V4	Det. -AVC	6AL5	6AL5	6BT	
V5	AF Amp. - Phase Inv.	12AX7	12AX7	9A	
V6	Output	6V6GT	6V6GT	7AC	
V7	Output	6V6GT	6V6GT	7AC	
V8	Rectifier	5Y3GT	5Y3GT	5T	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING: CAP.	RATING: VOLT.	REPLACEMENT DATA: MAGNAVOX PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲40	350	270021-43		CO30	FP376.7	TM-4125	D-170	TVL-2764
B	■35	350			BR4035	TC78		MTD-4530	TVA-2735
C	▲30	350							
D	30	350							
C2	20	25	270027-2	PRS25V25	BR202	TC26	TD-25-25	FM-0225	TVA-1205
C3	20	25	270027-2	PRS25V25	BR202	TC26	TD-25-25	FM-0225	TVA-1205

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: MAGNAVOX PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C4	10	500		NPO-S110	TCZ-10	5R5Q1	NPOK-100	ZT-541	MS-41	
C5	220		250207-48	S1220	D6-221	TP39	GP2K-221	UC-5322	5GA-T22	
C6	10000		250175-2	BPD-01	DD-103	KO82	811-01	DC511	5HK-S1	
C7	10000		250175-2	BPD-01	DD-103	KO82	811-01	DC511	5HK-S1	
C8	10000		250175-2	BPD-01	DD-103	KO82	811-01	DC511	5HK-S1	
C9	10000		250175-2	BPD-01	DD-103	KO82	811-01	DC511	5HK-S1	
C10	22	500	250187-43	NPO-S122	TCZ-22	5R5Q22	NPOK-22		MS-422	Note 2
C11	.033	600	250201-10	BPD-03	DF-303	CUB6S33		PT6133	6TM-S33	
C12	47		250207-11	NPO-S147	TCZ-47	TZ22	NPO-338-470	ZT-5447	5TCC-Q47	
C13	15	500	250187-43	NPO-S115	TCZ-15	5R5Q15	NPOK-150		MS-415	
C14	1.8		250221-117	NPO-S11.5	TCZ-1R5	TZ04	NPOA-1R5		5TCCB-V15	Note 1
C15	10000		250175-2	BPD-01	DD-103	KO82	811-01	DC511	5HK-S1	
C16A	100		♦ 250170-1	♦ PA-97-1	♦ PC-50	♦ 111TM1	♦1403-01	UC-531	♦ D-1	
B	100							UC-531		
C17	10000		250175-2	BPD-01	DD-103	KO82	811-01	DC511	5HK-S1	
C18	22		250187-45	NPO-S122	TCZ-22	5R5Q22	NPOK-220		MS-422	
C19	10000		250175-2	BPD-01	DD-103	KO82	811-01	DC511	5HK-S1	
C20	.1	200	250202-13	P288N-1	DF-104	CUB2P1		PT401	2TM-P1	
C21	.047	600	250201-11	BPD-05	DF-503	CUB6S47		PT6147	6TM-S47	
C22	220	500	250159-86	NPO-S1220	TCZ-220	5R5T22	NPO-335-221		MS-322	
C23	.047	600	250201-11	BPD-05	DF-503	CUB6S47		PT6147	6TM-S47	
C24	.01	600	250201-7	BPD-01	D6-103	CUB6S1	GP3-333-103	PT611	6TM-S1	
C25	.1	200	250202-13	P288N-1	DF-104	CUB2P1		PT401	2TM-P1	Note 4
C26	.0068	600	250201-6	S16800	D6-682	CUB6D68	GP3-333-682		6TM-D68	
C27	.1	200	250202-13	P288N-1	DF-104	CUB2P1		PT401	2TM-P1	Note 3
C28	10000	1000	250219-2	P1088N-01	DD16-103	CUB16S1		PT1611	10HK-S1	
C29A	10000	1000	250219-3	P1088N-01	DD16-103	CUB16S1		PT1611	10HK-S1	
B	10000	1000		P1088N-01	DD16-103	CUB16S1		PT1611	10HK-S1	

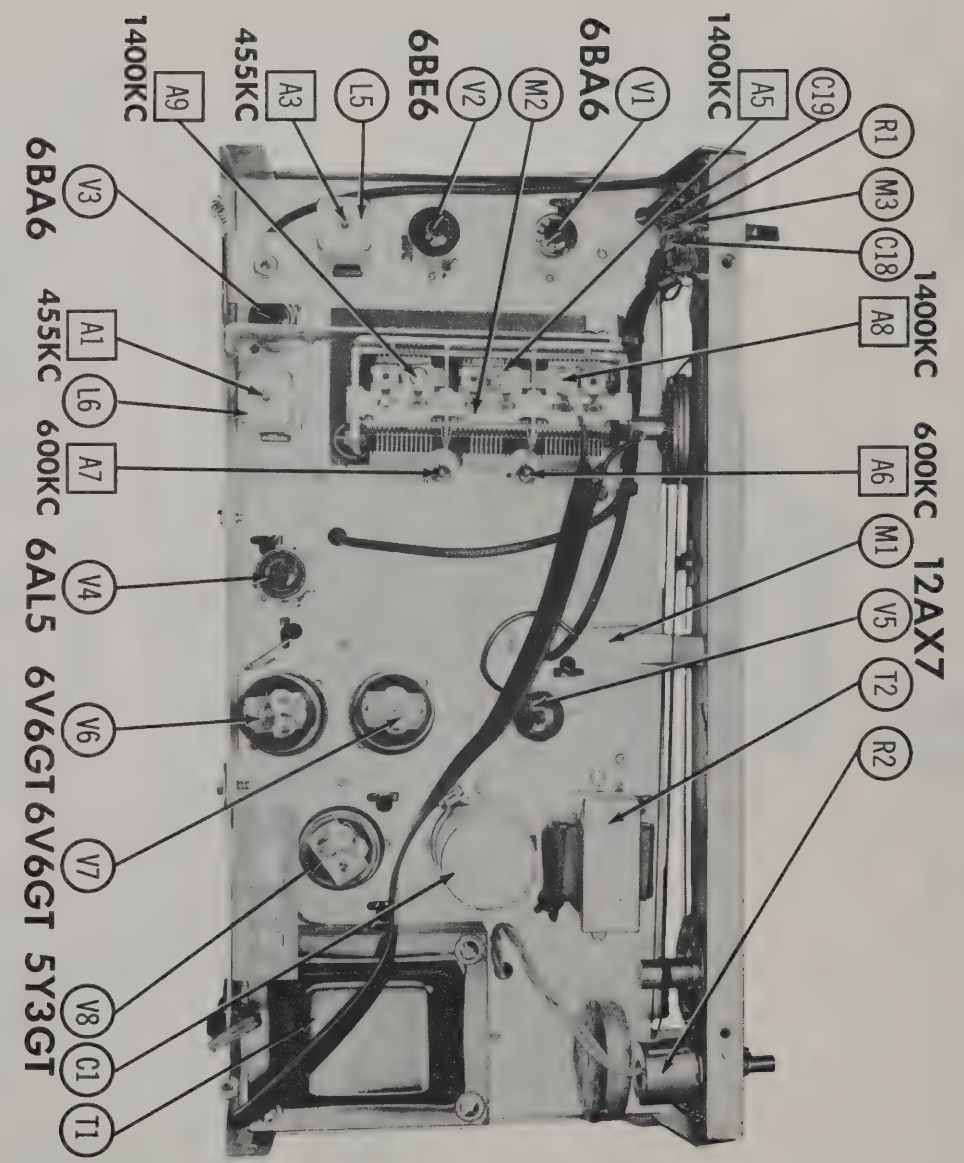
Note 1. Not used in some versions.
Note 2. Some versions use 15MMF in this application (Part No. 270187-43).
Note 3. Not used in chassis CR703B.
Note 4. . Not used in chassis CR703A.
♦ Items C16A, C16B, R17 are combined in one unit.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: MAGNAVOX PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	3Meg	½	220072-24	B-85	A47-3Meg-Z	Q13-140	U-57	Volume
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A.
R2A	5000Ω	½	220123-1	AB-705		Q17-114		Treble-See Note 1
B	Shaft		Not Req.	AK-3				Attach to R2A.
C	Switch		Not Req.	KB-1		76-1		Attach to R2A.

Note 1. Part No. 220123-2 used in some versions.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA MAGNAVOX PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R3	2200Ω	1/2		BTS-2200	
R4	1Meg	1/2	230104-98	BTS-1Meg	
R5	220K	1/2	230104-90	BTS-220K	Note 1
R6	4700Ω	1/2	230104-70	BTS-4700	
R7	1000Ω	1/2	230104-62	BTS-1000	
R8	1000Ω	1/2	230104-62	BTS-1000	
R9	220Ω	1/2	230104-54	BTS-220	
R10	100Ω	1/2	230104-50	BTS-100	
R11	220K	1/2	230104-90	BTS-220K	Note 2
R12	1Meg	1/2	230104-98	BTS-1Meg	
R13	22K	1/2	230104-78	BTS-22K	
R14	220Ω	1/2	230104-54	BTS-220	
R15	22K	1	230105-78	BTA-22K	
R16	8500Ω	3.9	240035-5		
R17	47K	1/2	♦ 250170-1	BTS-47K	
R18	150K	1/2	230104-88	BTS-150K	
R19	6.8Meg	1/2		BTS-6.8Meg	Note 3
R20	6.8Meg	1/2		BTS-6.8Meg	Note 3
R21	470K	1/2	230104-94	BTS-470K	
R22	1000Ω	1/2	230104-62	BTS-1000	
R23	3300Ω	1/2	230104-68	BTS-3300	
R24	22K	1/2	230104-78	BTS-22K	
R25	470K 5%	1/2	230104-94	BTS-470K 5%	
R26	47K	1/2	230104-82	BTS-47K	
R27	5600Ω	1/2	230104-71	BTS-5600	
R28	470K	1/2	230104-94	BTS-470K	
R29	470K	1/2	230104-94	BTS-470K	
R30	470Ω	1	230105-58	BTA-470	
R31	470Ω	1	230105-58	BTA-470	
R32	22K	1	230105-78	BTA-22K	
R33	10K	1/2		BTS-10K	Note 4
R34	10K	1/2	230104-75	BTS-10K	Note 5
R35	5600Ω	1/2	230104-71	BTS-5600	
R36	6800Ω	1/2	230104-72	BTS-6800	
R37	100Ω	1/2	230104-50	BTS-100	
R38	100Ω	1/2	230104-50	BTS-100	
R39	400Ω	10	240021-43		

Note 1. Omitted in Model CR-703A.
Note 2. Used only in Model CR-703A.
Note 3. 3.3Meg 1/2W may be used in this application.
Note 4. Used only in Model CR-703A.
Note 5. Not used in Model CR-703A.
♦ Items R17, C16A, C16B are combined in one unit.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	RATING SEC. 3	REPLACEMENT DATA MAGNAVOX PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC	520VCT	5VAC	6.3VAC	300075-G2					
	② .57A	.090ADC	② 2A	1.22A	300075-1 ①					
				SEC. 4						
				6.3VAC ② 1.22A						

① Alternate power trans.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA MAGNAVOX PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	9.3KΩ CT	1 to 3Ω	330037-G-2 330037-2 ①	Z1007	A-2901	A-3823	24S61	S-53X	① Alternate audio output.

COILS (RF-IF)

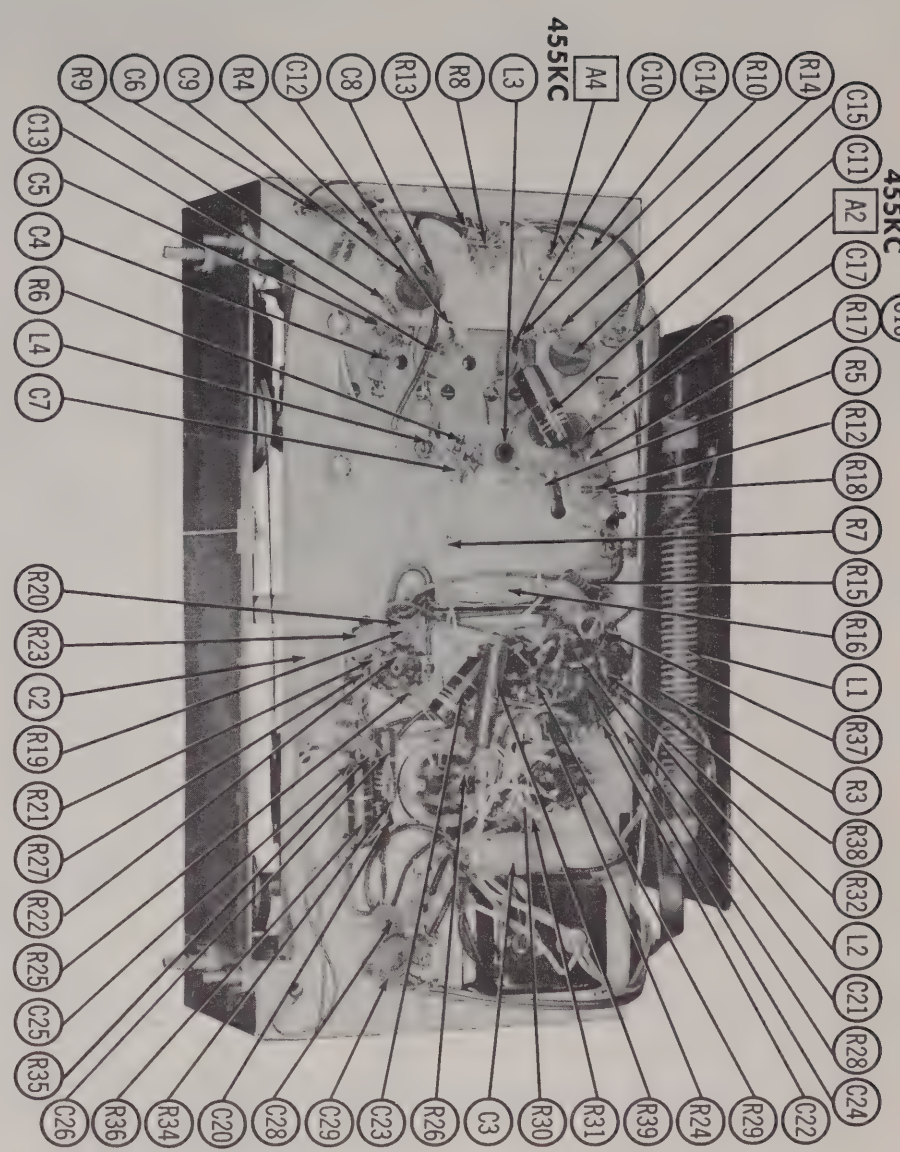
ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA MAGNAVOX PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Ant. Coil	.4Ω						Tapped ② .1Ω
L2	Ant. Loading Coil	8.3Ω			19-3250	TV-185	6181	260 Microhenries
L3	RF Coil	23Ω	3.7Ω	360329-1	14-1071 *		70-A *	
L4	Osc. Coil	5.5Ω		360407-1	14-1033	BC-381 ■	71-Osc. ■	Tapped ② .4Ω
L5	Input IF	10.5Ω	10.5Ω	360508-1				Tertiary Winding=.5Ω
L6	Output IF	10Ω	10Ω	360373-2	16-6758	BC-353	12-C2	

* Leads sufficient mounting support.
■ Use secondary winding.

MISCELLANEOUS

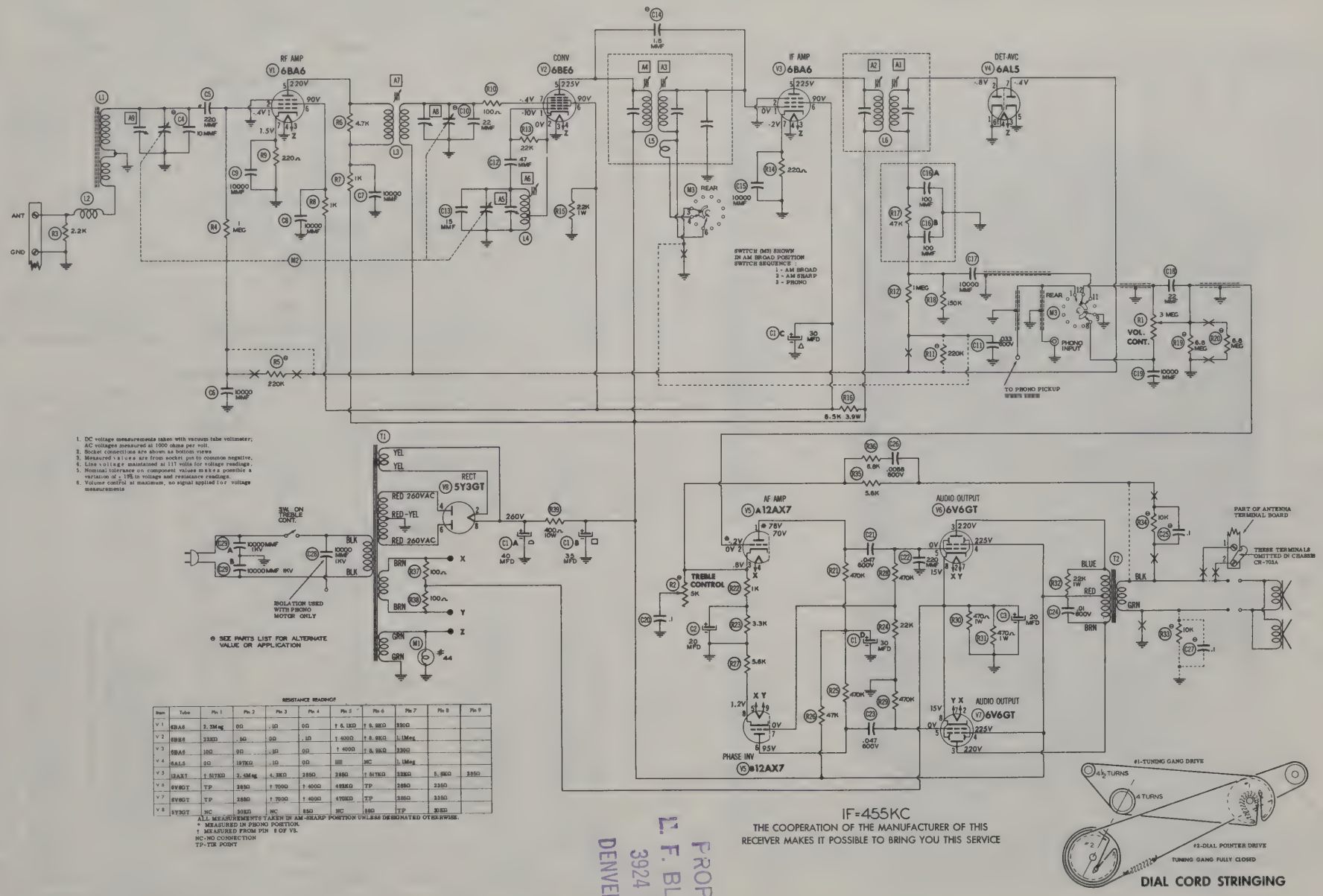
ITEM No.	PART NAME	MAGNAVOX PART No.	NOTES
M1	Dial Light		#44
M2	Tuning Cap.	260122-1	3 Gang (18-520MMF, 18-530MMF, 24-195MMF)
M3	Switch	160241-1	Selector (3P-3 Position-Rotary-Wafer Type)
	Dial Pointer	102426-7	
	Dial Glass	150395	

CHASSIS—BOTTOM VIEW



SET 309 FOLDER 11

MAGNAVOX Chassis CR-703



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements

⊕ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BA6	2.5Meg	0Ω	.1Ω	0Ω	↑ 6.1KΩ	↑ 8.8KΩ	350Ω		
V 2	6BE6	22KΩ	.5Ω	0Ω	.1Ω	↑ 400Ω	↑ 8.8KΩ	1.1Meg		
V 3	6BA6	10Ω	0Ω	.1Ω	0Ω	↑ 400Ω	↑ 8.8KΩ	330Ω		
V 4	6AL5	0Ω	197KΩ	.1Ω	0Ω	NC	NC	1.1Meg		
V 5	12AX7	↑ 81KΩ	3.4Meg	4.8KΩ	285Ω	285Ω	↑ 81KΩ	32KΩ	5.8KΩ	285Ω
V 6	6V6GT	TP	285Ω	↑ 700Ω	↑ 400Ω	492KΩ	TP	285Ω	235Ω	
V 7	6V6GT	TP	285Ω	↑ 700Ω	↑ 400Ω	470KΩ	TP	285Ω	235Ω	
V 8	5Y3GT	NC	50KΩ	NC	85Ω	NC	88Ω	TP	50KΩ	

ALL MEASUREMENTS TAKEN IN AM-SHARP POSITION UNLESS DESIGNATED OTHERWISE.
* MEASURED IN PHONO POSITION.
↑ MEASURED FROM PIN 8 OF V8.
NC-NO CONNECTION
TP-TIE POINT

IF=455KC

THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

DIAL CORD STRINGING

309-11

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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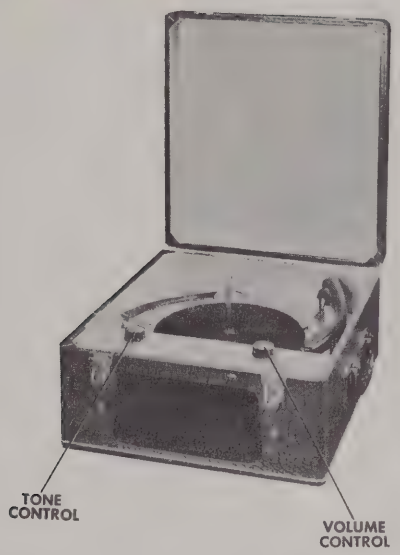
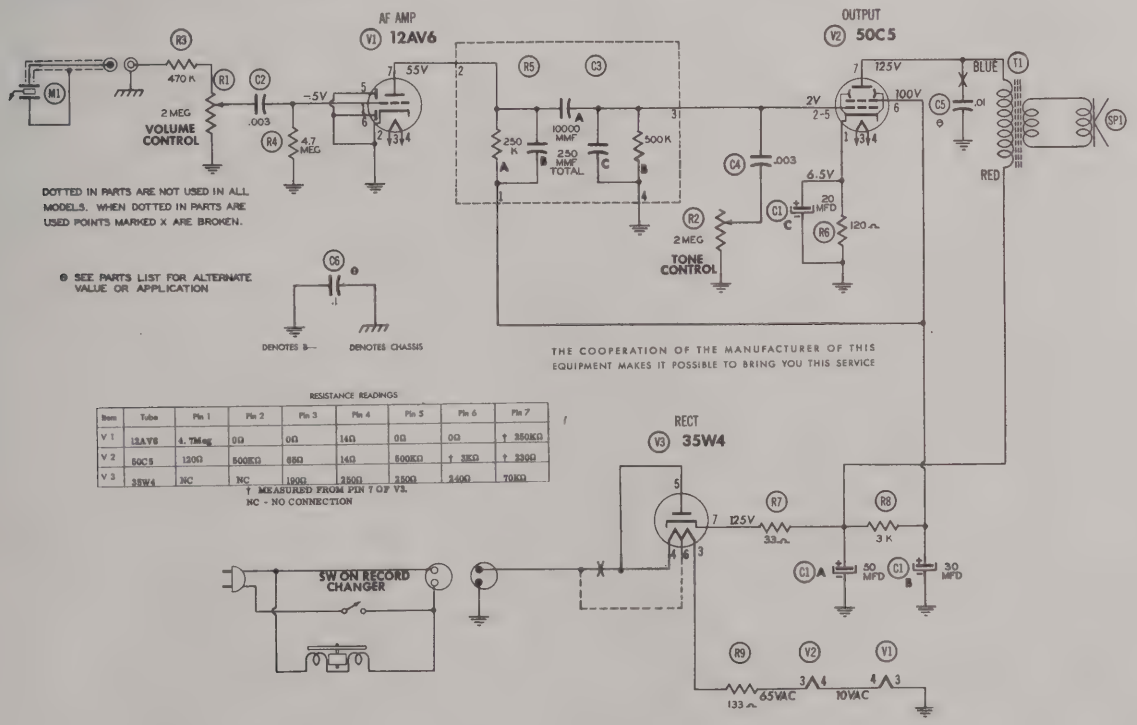


MITCHELL
MODEL 1270

MITCHELL
MODEL 1270

TRADE NAME	Mitchell Model 1270
MANUFACTURER	Mitchell Mfg. Co., 2525 Clybourn Ave., Chicago 14, Ill.
TYPE SET	AC Operated Phono Amplifier with 3 Speed Automatic Record Changer
TUBES (Three)	Types 12AV6 AF Amp., 50C5 Output, 35W4 Rectifier
POWER SUPPLY	105-125 Volts AC-60 Cycles
RATING	.22 Amp. @ 117 Volts AC

FOR SERVICE INFORMATION ON RECORD CHANGER-SEE SIMILAR V-M MODEL 950-PHOTOFACT SET #216-FOLDER #11 OR RECORD CHANGER MANUAL CM-5.


AF AMP
V1 12AV6
OUTPUT
V2 50C5
RECT
V3 35W4
VOLUME CONTROL
TONE CONTROL
DOTTED IN PARTS ARE NOT USED IN ALL MODELS. WHEN DOTTED IN PARTS ARE USED POINTS MARKED X ARE BROKEN.
@ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION
DENOTES B—
DENOTES CHASSIS
THE COOPERATION OF THE MANUFACTURER OF THIS EQUIPMENT MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
SW ON RECORD CHANGER
65VAC
10VAC

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12AV6	4. 7Meg	0Ω	0Ω	14Ω	0Ω	0Ω	↑ 250KΩ
V 2	50C5	120Ω	500KΩ	68Ω	14Ω	500KΩ	↑ 35Ω	↑ 239Ω
V 3	35W4	NC	NC	190Ω	250Ω	250Ω	240Ω	70KΩ

↑ MEASURED FROM PIN 7 OF V2.
NC - NO CONNECTION

PHOTOFACT STANDARD NOTATION SCHEMATIC
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309-12

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: MITCHELL PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	AF Amp.	12AV6	12AV6	7BT	
V2	Output	50C5	50C5	7CV	
V3	Rectifier	35W4	35W4	6BQ	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING: CAP.	RATING: VOLT.	REPLACEMENT DATA: MITCHELL PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	■ 50	150	1000	AFH3-77	CO56	FP310	TM-3011	T-295	TVL-3440
B	▲ 30	150							
C	20	25							

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: MITCHELL PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C2	.003	600	1002	SI3000	D6-302	CUB6D3	GP2-333-302	PT623	6TM-D3	
C3A	10000		♦ 1001	♦ PA-112-4	♦ PC-81	♦ 113TM2	♦ 1404-02		♦ T-2	
B	250									
C										
C4	.003	600	1002	SI3000	D6-302	CUB6D3	GP2-333-302	PT623	6TM-D3	
C5	.01	400		BPD-01	D6-103	CUB4S1	GP2-333-103	PT411	4TM-S1	Note 1
C6	.1	200		P288N-1	DF-104	CUB2P1		PT401	2TM-P1	Note 2

Note 1. Not used in all versions.
Note 2. Some versions use .05MFD in this application (Part No. 1003).
♦ Items C3A, C3B, C3C, R5A, R5B are combined in one unit.
When replacing items separately, C3B and C3C should total 250MMF.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: MITCHELL PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	2Meg	½	BA011-794	AB-76	A47-2Meg-Z	Q13-139	U-55	Volume
B	Shaft		Not Req.	AK-4	KSS-3	Not Req.	Not Req.	Attach to R1A.
R2A	2Meg	½	BA011-794	AB-76	A47-2Meg-Z	Q13-139	U-55	Tone
B	Shaft		Not Req.	AK-4	KSS-3	Not Req.	Not Req.	Attach to R2A.

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: MITCHELL PART No.	IRC PART No.	NOTES
R3	470KΩ	½	1006	BTS-470K	
R4	4.7Meg	½	1007	BTS-4.7Meg	
R5A	250KΩ	½	♦ 1001	BTS-250K	
B	500KΩ	½		BTS-500K	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: MITCHELL PART No.	IRC PART No.	NOTES
R6	120Ω	½		BTS-120	Note 1
R7	33Ω	½	1011	BTS-33	
R8	3000	1		BTA-3000	Note 2
R9	133	10	1012		

Note 1. Some versions may use a 150Ω in this application.
Note 2. Some versions may use a 2600Ω in this application.
♦ R5A, R5B, C3A, C3B & C3C are combined in one unit.

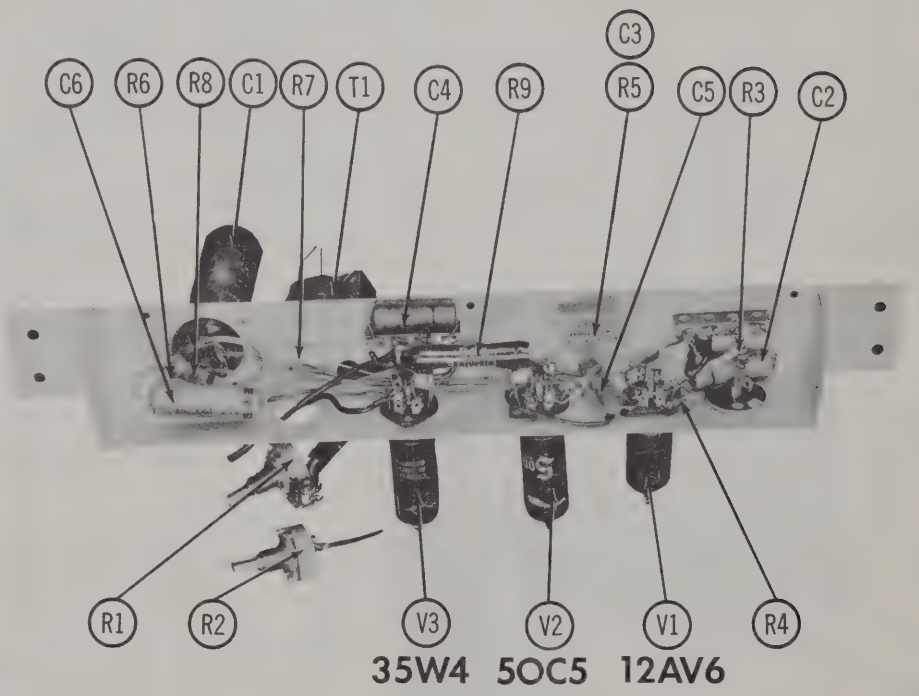
TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	IMPEDANCE: SEC.	REPLACEMENT DATA: MITCHELL PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	2.4KΩ	3.3Ω	1013	Z1001	A-2928	A-3876	24S50	S-2X	

SPEAKER

ITEM No.	RATINGS: SIZE	RATINGS: FIELD	RATINGS: V. C. IMP.	REPLACEMENT DATA: MITCHELL PART No.	QUAM PART No.	RCA TYPE No.	NOTES
SP1	4"x 6"	PM	3.3Ω	1014	46A07	246S2	

CHASSIS—BOTTOM VIEW



PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA: MITCHELL PART No.	ASTATIC PART No.: CARTRIDGE	ASTATIC PART No.: NEEDLE	ELECTRO-VOICE PART No.: CARTRIDGE	ELECTRO-VOICE PART No.: NEEDLE	REMARKS
M1	1015	ACD-J	A-1 A-3	46T	0-1 or S-1 and 0-3	

ASTATIC AND ELECTRO-VOICE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENT SEE BELOW.

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA: MITCHELL PART No.	JENSEN PART No.	PERMO PART No.	WALCO PART No.	REMARKS
M2	1016 33 1/3-45 Needle	† JPS-30LP or * JP-30LP	† A-300 or * A-322 or ♦ A-300D	† W-30MGS or * W-30MGA	* Metal † Jewel ♦ Diamond
M3	1017 78RPM Needle	* JP-30 or † JPS-30	* C-320 or † C-318 or ♦ C-318D	* W-30A or † W-30S	

PHOTOFACT* Folder

PHILCO MODELS 24C6005, 24C6105M, 24C6108 (Ch. TV304)

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PHILCO MODEL 24C6105M

TRADE NAME	Philco Models 24C6005, 24C6105M, 24C6108 (Ch. TV304)
MANUFACTURER	Philco Corp., Tioga & "C" Streets, Philadelphia, Pa.
TYPE SET	Television Receiver
TUBES	Seventeen
POWER SUPPLY	110-120 Volts AC-60 Cycle RATING 1.66 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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PHILCO MODELS 24C6005, 24C6105M, 24C6108 (Ch. TV304)

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DATE 3-56 SET 309 FOLDER 13

PHILCO MODELS 24C6005, 24C6105M, 24C6108 (Ch. TV304)

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 2 metal screws. Remove plastic knob cover from front panel of cabinet.

2. Remove 7 push-on type control knobs from front panel of cabinet.

3. Remove 5 wood screws. Remove rear cover.

4. Disconnect speaker leads, HV lead, picture tube socket and yoke plug.

5. Remove 5 chassis bolts. Remove chassis.

6. Remove 2 speaker nuts. Remove speaker.

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MODEL	CHASSIS
24C6005, 24C6105M, 24C6108	TV304

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removing the channel selector and fine tuning knobs.

PICTURE TUBE SAFETY GLASS CLEANING

To clean safety glass remove 3 metal screws holding metal strip at the top of the safety glass. Remove metal strip and safety glass. Use extreme caution when removing safety glass.

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION

See tube placement chart on page 5.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

For adjustment of the horizontal oscillator, it is necessary to remove the rear cover and supply power to set. Adjustment is located on top of chassis. Set the horizontal hold control at the center of its range and adjust the horizontal oscillator slug (L40) until picture synchronizes horizontally. (For location see tube placement chart).

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary (A26) located on top of chassis. (See tube placement chart).

FUSES

One fuse is used for LV power supply protection. (For location see tube placement chart).

CENTERING

Centering is accomplished mechanically by means of centering lever on the PM focusing assembly. Adjust the centering lever from side to side, and up and down until the picture is properly centered.

ANTI-PIN CUSHION ADJUSTMENT

Reduce the picture size so that the sides of the raster are visible, and position the magnets so that all sides are straight lines and the corners are at right angles.

PHILCO MODELS 24C6005, 24C6105M, 24C6108 (Ch. TV304)

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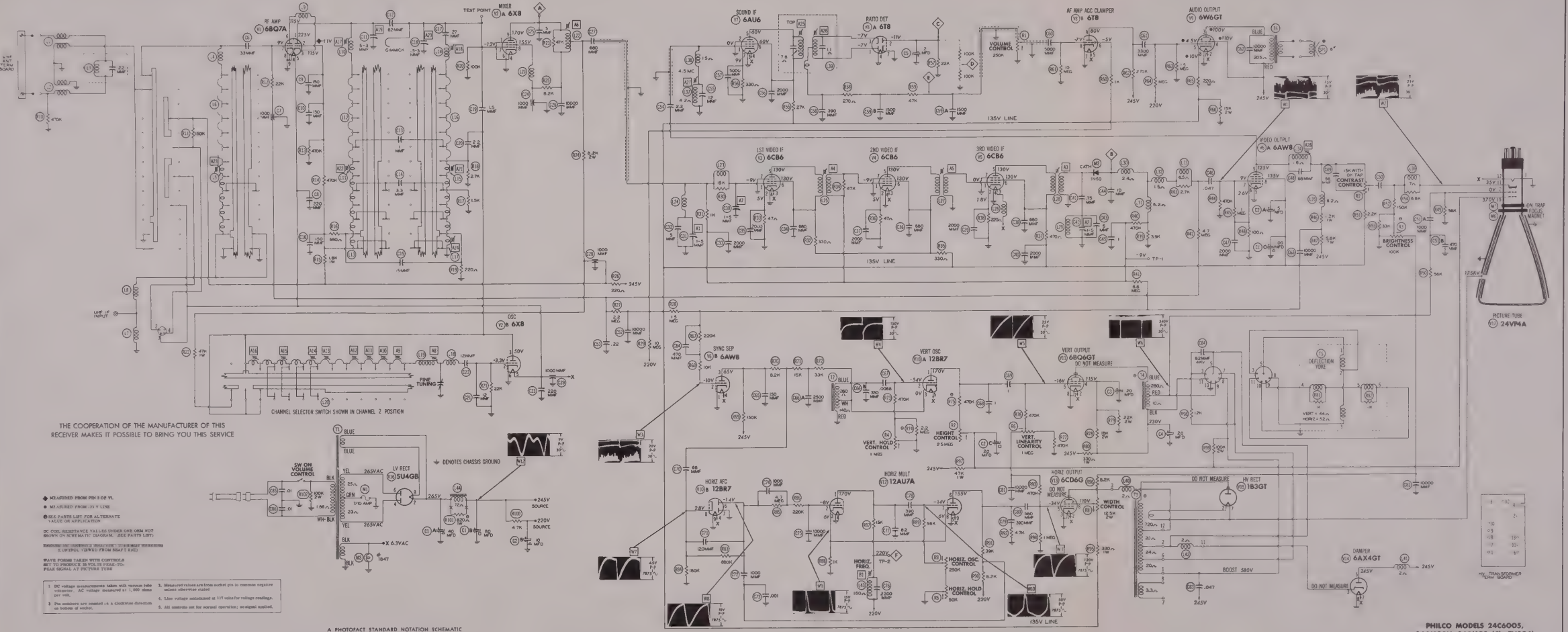
RF AMP V1 6BQ7A
MIXER V2A 6X8
TEST POINT
SOUND IF V1 6AU6
RATIO DET V4A 6T8
AF AMP AGC CLAMPER V4B 6T8
AUDIO OUTPUT V5 6W6GT
VOLUME CONTROL 250K
1ST VIDEO IF V3 6CB6
2ND VIDEO IF V4 6CB6
3RD VIDEO IF V5 6CB6
VIDEO OUTPUT V6A 6AW8
CONTRAST CONTROL
BRIGHTNESS CONTROL 100K
PICTURE TUBE V17 24VP4A
ION TRAP FOCUS MAGNET
OSC V2B 6X8
FINE TUNING
CHANNEL SELECTOR SWITCH SHOWN IN CHANNEL 2 POSITION
SYNC SEP V6B 6AW8
VERT OSC V10A 12BR7
VERT OUTPUT V11 6BQ6GT DO NOT MEASURE
VERT. HOLD CONTROL 1 MEG
HEIGHT CONTROL 2.5 MEG
VERT. LINEARITY CONTROL 1 MEG
HORIZ AFC V10B 12BR7
HORIZ MULT V12 12AU7A
HORIZ OUTPUT V13 6CD6G DO NOT MEASURE
HORIZ. FREQ. CONTROL
HORIZ. OSC. CONTROL 200K
HORIZ. HOLD CONTROL 50K
WIDTH CONTROL 12.5K 2W
BOOST 580V
DO NOT MEASURE
DAMPER V14 6AX4GT
HV RECT V15 1B3GT
LV RECT V16 5U4GB
SW ON VOLUME CONTROL
DENOTES CHASSIS GROUND
135V LINE
245V
220V
TP-1
TP-2
THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
◆ MEASURED FROM PIN 3 OF V1
● MEASURED FROM 135 V LINE
SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION
DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM. (SEE PARTS LIST)
WAVE FORMS TAKEN WITH CONTROLS SET TO PRODUCE 35 VOLTS PEAK-TO-PEAK SIGNAL AT PICTURE TUBE
1. DC voltage measurements taken with vacuum tube voltmeter. AC voltage measured at 1,000 ohms per volt.
2. Pin numbers are counted +k a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. All controls set for normal operation; no signal applied.
A PHOTOFACT STANDARD NOTATION SCHEMATIC
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PHILCO MODELS 24C6005, 24C6105M, 24C6108 (Ch. TV304)

PHILCO MODELS 24C6005, 24C6105M, 24C6108 (Ch. TV304)

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CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

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CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

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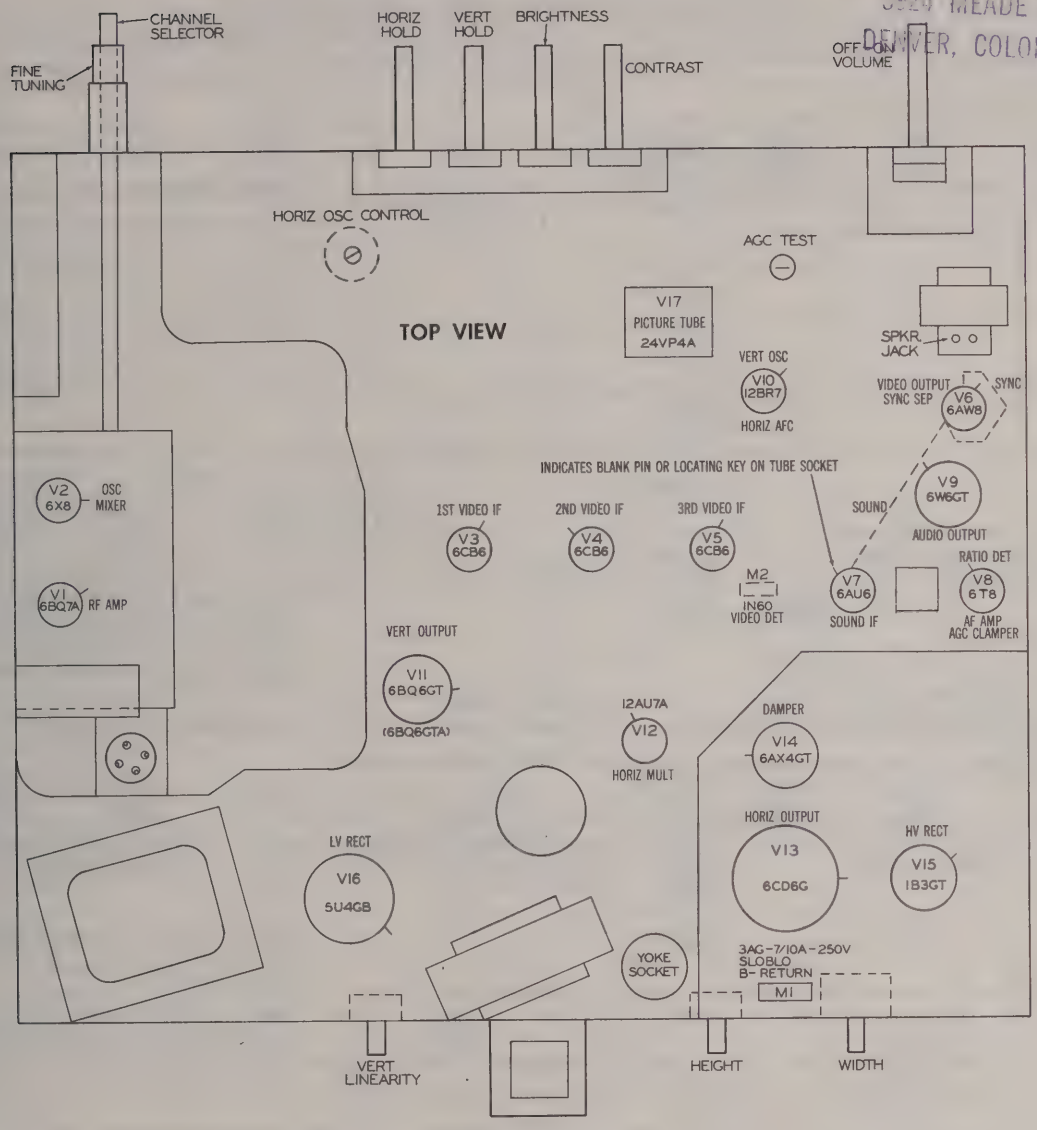
TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - V16, Fuse (M1)

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - V2, V3, V4, V5, V6, V9
No pic, no sound, has snow - V1, V2, V3
No pic, has sound, has raster - V6, V17
Has pic, no sound - V7, V8, V9
Overloaded picture - V8

SYNC FAILURE
No vert. sync - V6, V10
No horiz. sync - V6, V10, V12
No vert. or horiz. sync - V6

SWEEP FAILURE
No raster, has sound - V12, V13, V14, V15, V17
No vertical deflection - V10, V11
Poor vert. linearity or foldover - V10, V11
Poor horiz. linearity or foldover - V12, V13, V14
Narrow picture - V12, V13, V14, V15, V16
Vert. off freq. - V6, V10
Horiz. off freq. - V6, V10, V12

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Allow 15 minutes for receiver and test equipment to warm up. There must be a good bond between chassis and test equipment.
Connect the deflection yoke and speaker during alignment. Do not remove the horizontal oscillator tube (V12) to disable the high voltage. The high voltage lead should be securely taped and kept away from the chassis. The IF shield must be in place.

VIDEO IF ALIGNMENT

Set contrast control fully clockwise.
Connect negative lead of 5 volt bias supply to TP1. Positive to chassis.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Tube Shield	High side to floating tube shield over dummy 6X8 Osc. Tube with Pin 3 removed.	Not used	47.25MC (400∿ 30% Mod.)	2	Vert. Amp. to Pin 11 of picture tube. Low side to chassis.	A1, A2	Adjust for MINIMUM indication on scope.
2.	"	"	"	44.0MC (400∿ 30% Mod.)	"	"	A3	Adjust for maximum indication on scope.
3.	"	"	"	42.7MC (400∿ 30% Mod.)	"	"	A4	"
4.	"	"	"	45.0MC (400∿ 30% Mod.)	"	"	A5	"
5.	"	"	"	45.5MC (400∿ 30% Mod.)	"	"	A6	"
6.	Fig. 1	Across antenna terminal thru matching network (Fig. 1).	"	42.3MC (400∿ 30% Mod.)	"	"	A7	"
7.	"	"	69MC (6MC Swp.	42.5MC 45.75MC	4	"		Check response curve for curve limits and marker position as in Fig. 2. If necessary, readjust A5 and A6 for proper curve level, and A2 and A4 for proper marker positions. CAUTION: Retouch only slightly. Replace 6X8 back in socket.

OSCILLATOR ALIGNMENT

Disconnect white wire (AGC line) from main chassis going to tuner. Connect negative lead of 1.5 volt bias supply to loose end. Positive lead to chassis.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50Ω.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
8.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	Not used	257MC	13	Vert. Amp. thru 1KΩ to point (A). Low side to chassis.	A8	Adjust for zero beat on scope. If regeneration occurs, increase bias; bias may be increased up to 4 or 5 volts, if necessary.
				251MC	12		A9	
				245MC	11		A10	
				239MC	10		A11	
9.	"	"	"	233MC	9	"	A12	Adjust A12 for channel 9 frequency. Recheck A12 for channel 8 frequency. If necessary, make compromise between channel 8 and 9 for zero beat on scope.
				227MC	8			
10.	"	"	"	221MC	7	"	A13	Adjust for zero beat. Recheck steps 8, 9, and 10. If necessary, readjust until channels are within 500KC of their proper frequencies.
11.	"	"	"	129MC	6	"	A14	Adjust for zero beat on scope.
12.	"	"	"	113MC	4	"	A15	"
13.	"	"	"	101MC	2	"	A16	"

RF AND MIXER ALIGNMENT

Connect bias as in "Oscillator Alignment". Disconnect tuner coupling link leads and connect a 40 to 70Ω carbon resistor across the open lead from the tuner. Remove V3 from its socket. Adjust scope controls to obtain a width sweep twice the height.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50Ω.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
14.	Fig. 1	Across antenna input thru matching network.	213MC (10MC Swp.)	213MC	13	Vert. Amp. thru 1KΩ to point (A). Low side to chassis.	A17, A18	Adjust for response similar to Fig. 3. Adjust A17 first to set carrier level then adjust A18 for proper tilt.
15.	"	"	177MC (10MC Swp.)	177MC	7	"	A19, A20	Check for response indicated by dotted lines in Fig. 4A and 4B. If necessary, adjust for mirror image of original response curve. (Tilt in opposite direction). If response appears as in Fig. 4A, adjust A19 and A20 until curve appears as in Fig. 4B. This adjustment overcompensates to allow for channel 13 adjustment. Repeat steps 14 and 15 until centered and symmetrical response curves are obtained on channels 7 and 13.
16.	"	"	85MC (10MC Swp.)	85MC	6	"	A21, A22, A23, A24	Adjust for symmetrical response approximately center of bandpass. Adjust A21 counter clockwise until single peak appears. Adjust A22 until peak falls on 85MC marker. Adjust A23 for maximum curve amplitude and symmetry of single peak. Retouch SLIGHTLY, if necessary, A21 and A22 for symmetrical response centered at approximately the 85MC marker point similar to Fig. 3.

ALIGNMENT INSTRUCTIONS (cont)

UHF IF ALIGNMENT

Connect bias as in "Oscillator Alignment". Disconnect tuner coupling link leads and connect a 40 to 70Ω carbon resistor across the open lead from the tuner. Remove V3 from its socket. Adjust scope controls to obtain a width sweep twice the height. Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection. The sweep generator output lead should be terminated with its characteristic impeadnce, usually 50Ω.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
17.	Direct	UHF input jack	43.5MC (10MC Swp.)	43.5MC	UHF	Vert. Amp. thru 1KΩ to point (A). Low side to chassis.	A24	Adjust for flat response.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Remove 6CB6 (V3, 1st Video IF Tube) from its socket. Connect two matched 100KΩ (±1%) resistors in series from point (C) to chassis. The junction of these two resistors is alignment point (D) as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
18.	2200Ω Carbon Resistors	High side thru 2200Ω resistor to point (B). Low side to chassis.	4.5MC (400∿ 30% Mod.)	Any non-interfering channel	DC probe to point (C). Common to chassis.	A25 A27	Adjust for maximum indication.
19.	"	"	"	"	DC probe to point (E). Common to point (D).	A26	Adjust for MINIMUM indication. A zero reading will be obtained on either side of the correct setting. Replace V3 in its socket.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Remove 6CB6 (V3, 1st Video IF Tube) from its socket. Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
18.	2200Ω Carbon Resistor	High side to point (B). Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any	Vert. Amp. to point (C). Low side to chassis.	A25, A26	Disconnect stabilizing capacitor C5. Increase generator output for reading on scope. Adjust for curve of maximum amplitude and symmetry similar to Fig. 5.
19.	"	"	"	"	"	Vert. Amp. to point (E). Low side to chassis.	A27	Reconnect C2. Increase generator output for reading on scope. Adjust A27 so that 4.5MC marker occurs at crossover lines as in Fig. 6. SLIGHTLY readjust A26, for maximum amplitude and straightness of crossover lines. Replace V3 in its socket.

4.5MC TRAP ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
20.	2200Ω Carbon Resistor	High side thru 2200Ω resistor to point (B). Low side to chassis.	4.5MC (400∿ 30% Mod.)	Any non-interfering channel	Positive lead thru crystal probe to pin 11 of picture tube.	A28	Adjust for MINIMUM indication.

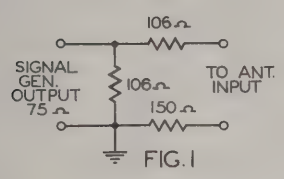


FIG. 1

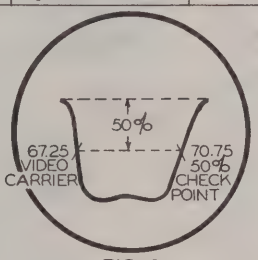


FIG. 2

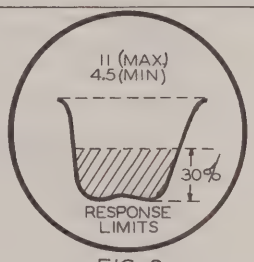


FIG. 3

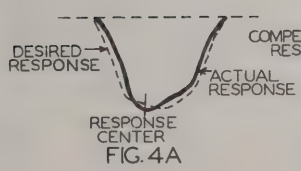


FIG. 4A

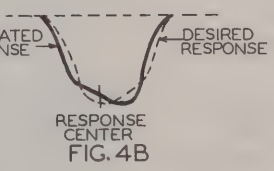


FIG. 4B

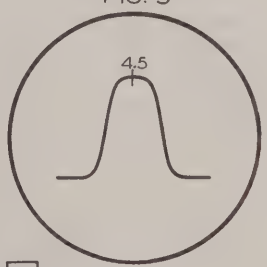


FIG. 5

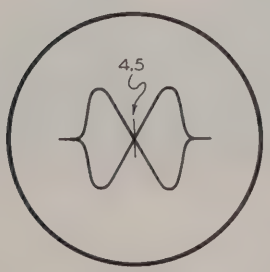
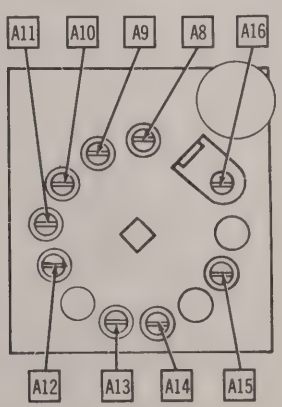


FIG. 6



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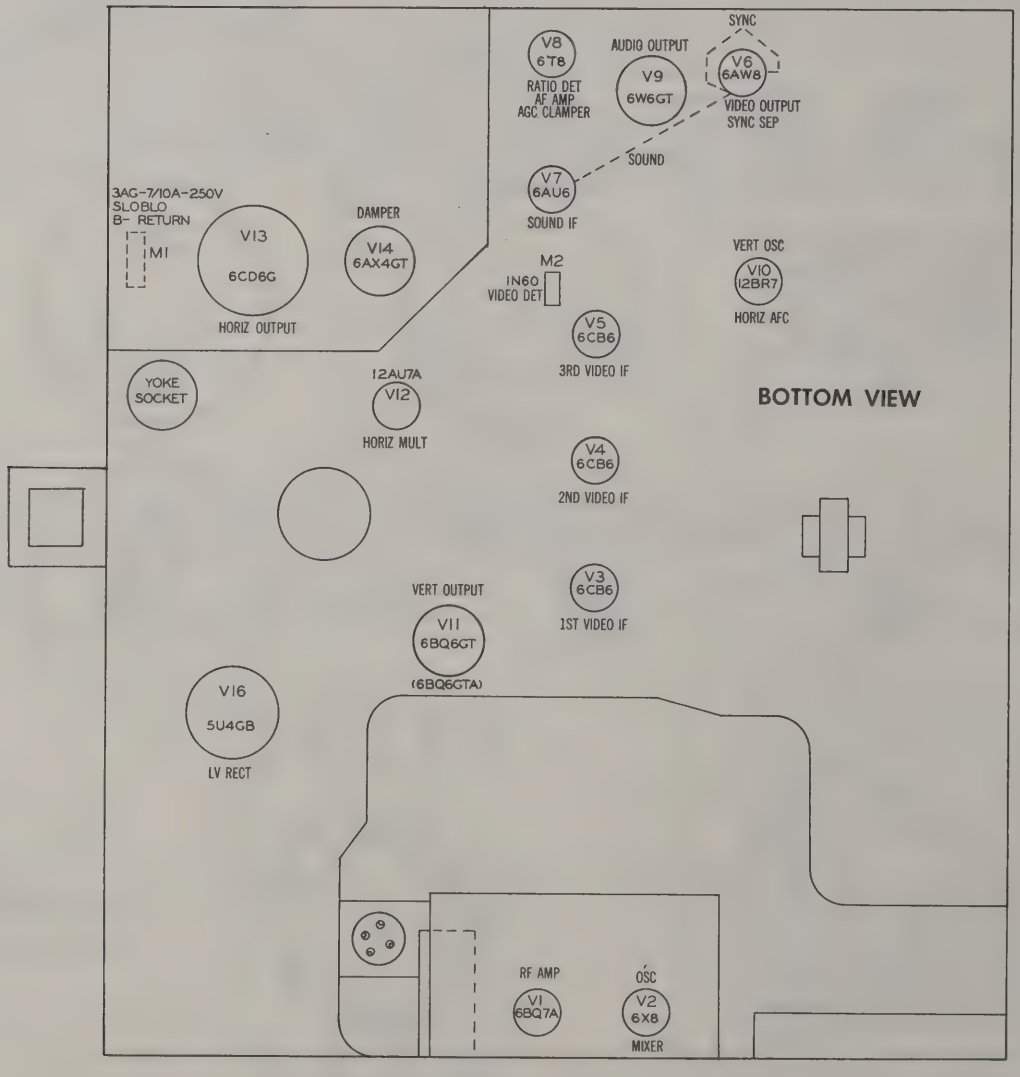
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BQ7A	†2.1KΩ	250KΩ	INF	0Ω	.1Ω	INF	2.7Meg	0Ω	0Ω
V 2	6X8	0Ω	22KΩ	†47KΩ	0Ω	.1Ω	0Ω	100KΩ	†17KΩ	†8.5KΩ
V 3	6CB6	470KΩ	47Ω	.1Ω	0Ω	■660Ω	■660Ω	0Ω		
V 4	6CB6	470KΩ	47Ω	.1Ω	0Ω	■330Ω	■330Ω	0Ω		
V 5	6CB6	.1Ω	220Ω	.1Ω	0Ω	■470Ω	■470Ω	0Ω		
V 6	6AW8	0Ω	3Meg	†150KΩ	.1Ω	0Ω	100Ω	350KΩ	10KΩ	†6.8KΩ
V 7	6AU6	5.7Ω	0Ω	0Ω	.1Ω	■27KΩ	■27KΩ	330Ω		
V 8	6T8	300KΩ	22KΩ	300KΩ	0Ω	.1Ω	2.5Meg	0Ω	10Meg	†270KΩ
V 9	6W6GT	TP	.1Ω	†280Ω	†72Ω	1.5Meg	TP	0Ω	10KΩ	
V 10	12BR7	▲1.3Meg	800KΩ	140Ω	.1Ω	.1Ω	900KΩ	0Ω	180KΩ	0Ω
V 11	6BQ6GT	NC	.1Ω	TP	†13KΩ	1Meg	NC	0Ω	0Ω	TOP CAP †700Ω
V 12	12AU7A	†20KΩ	6Meg	1KΩ	0Ω	0Ω	†50KΩ	130KΩ	1KΩ	.1Ω
V 13	6CD6G	TP	.1Ω	0Ω	TP	700KΩ	NC	0Ω	■4KΩ	TOP CAP ▲ 24Ω
V 14	6AX4GT	NC	NC	150KΩ	TP	†75Ω	NC	.1Ω	0Ω	
V 15	1B3GT		PINS	1 - 8	HAVE	INF	RESISTANCE			TOP CAP ▲ 742Ω
V 16	5U4GB	NC	15KΩ	NC	25Ω	NC	27Ω	NC	15KΩ	
V 17	24UP4A	0Ω	56KΩ	PIN 10 ▲100KΩ	PIN 11 170KΩ	PIN 12 .1Ω				

† MEASURED FROM PIN 2 OF V16
■ MEASURED FROM 135V LINE
▲ MEASURED FROM PIN 3 OF V14
TP - TIE POINT
NC - NO CONNECTION



TUBE PLACEMENT CHART

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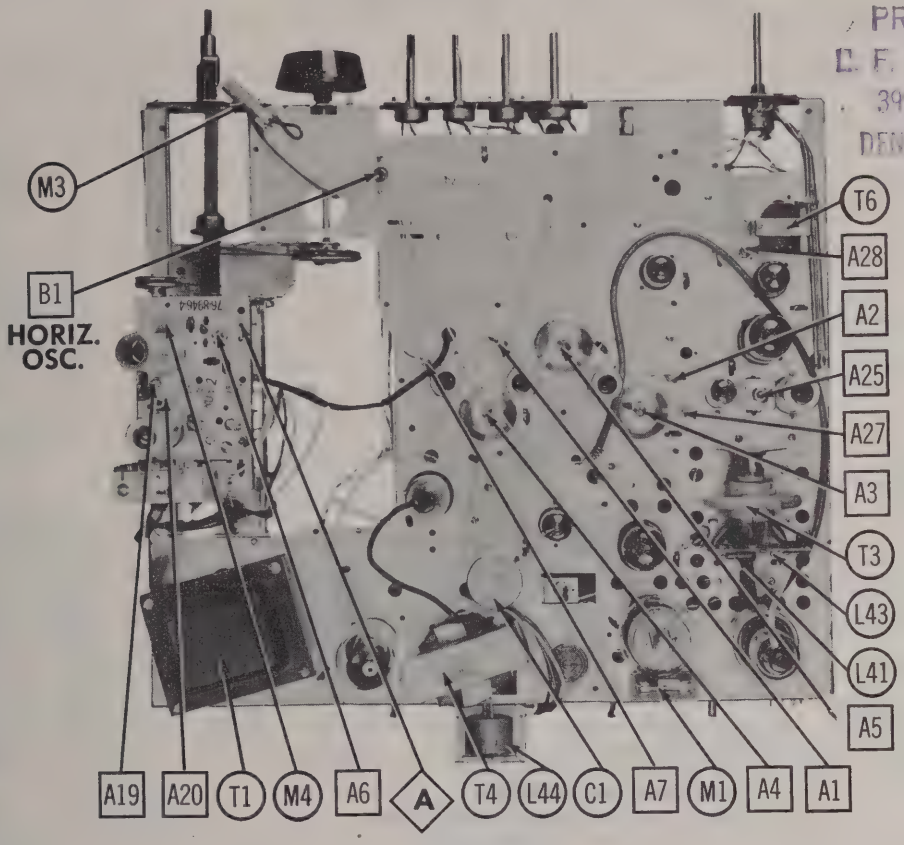
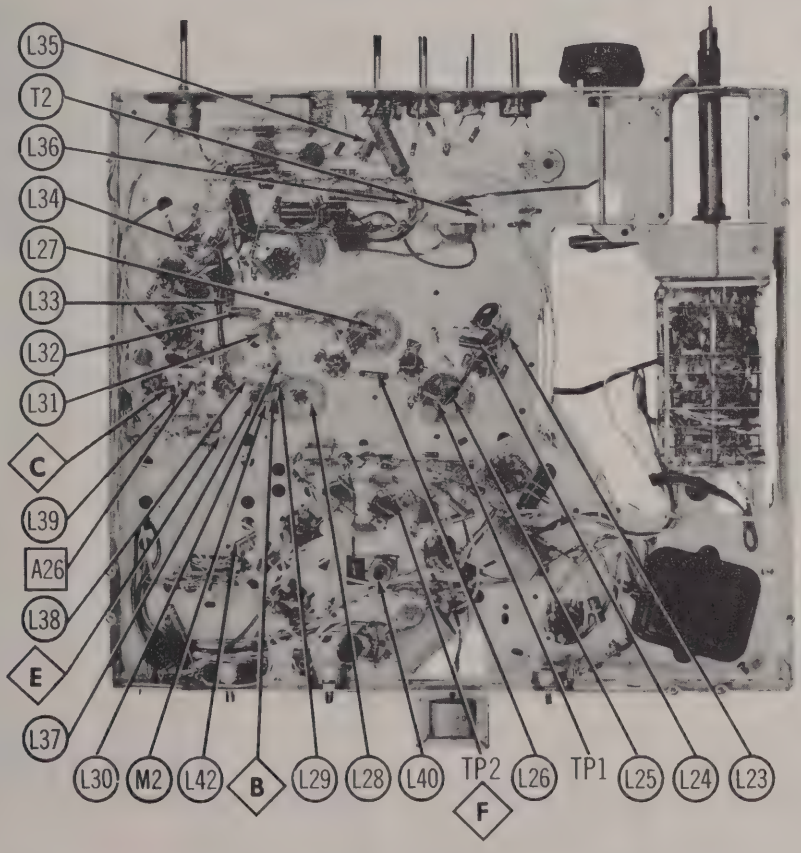


CHASSIS TOP VIEW



TP1 -.9V
IF AGC
TP2 220V
B+ V12

CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: PHILCO Part No.	STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	RF Amplifier	6BQ7A	6BQ7A	9AJ	
V2	Osc.-Mixer	6X8	6X8	9AK	
V3	1st. Video IF Amp.	6CB6	6CB6	7CM	
V4	2nd. Video IF Amp.	6CB6	6CB6	7CM	
V5	3rd. Video IF Amp.	6CB6	6CB6	7CM	
V6	Video Output-Sync Separator	6AW8	6AW8	9DX	
V7	Sound IF amp.	6AU6	6AU6	7BK	
V8	Ratio Det.-AF Amp. -AGC- Clamper	6T8	6T8	9N	
V9	Audio Output	6W6GT	6W6GT	7AC	
V10	Vert. Osc.-Horiz. AFC	12BR7	12BR7	9CF	
V11	Vert. Output	6BQ6GT	6BQ6GT	8AM	6BQ6GTA may be used as an alternate
V12	Horiz. Shkl.	12AU7A	12AU7A	9A	
V13	Horiz. Output	6CD6G	6CD6G	5BT	
V14	Damper	6AX4GT	6AX4GT	4CG	
V15	HV Rectifier	1B3GT	1B3GT	3C	
V16	LV Rectifier	5U4GB	5U4GB	5T	

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA: PHILCO Part No.	CBS	GENERAL ELECTRIC Part No.	SYLVANIA Part No.	WESTINGHOUSE Part No.	RETMA BASE TYPE	NOTES
V17	34VP4A ①	24VP4A ①		24VP4A ② 24V24		12L	① Aluminized ② Silver screen "86"

ELECTROLYTIC CAPACITORS

ITEM No.	RATING: CAP.	VOLT	REPLACEMENT DATA: PHILCO Part No.	AEROVOX Part No.	CORNELL-DUBILIER Part No.	MALLORY Part No.	PYRAMID Part No.	SANGAMO Part No.	SPRAGUE Part No.
C1A	40	400	30-3584-54		C1B	UFT75	TM-4A16	T-740	TVL-3764
B	80	350			BM4065	TC478		FM-4540	TVA-1713
C	100	200							
D	300	50	(Note D)						
C3A	5	150	30-3584-50		C1J	FT250	TM-3A40	T-185	TVL-3750
B	10	350			BR1235	TC460		MT-1504	TVA-1603
C	30	475							
D	30	350	30-3417-44	PR8450V30	BR3035	TC05	TD-30-350	FM-4530	TVA-1606
C4	30	350	30-3417-44	PR8450V30	BR3035	TC05	TD-30-350	FM-4530	TVA-1606
C5	5	50	30-3417-7	PR330V5	BBR2-50T	TC302	TD-2-50	MMT-0505	TVA-1301

Note 1. C1D is not used.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	VOLT	REPLACEMENT DATA: PHILCO Part No.	AEROVOX Part No.	CENTRALAB Part No.	CORNELL-DUBILIER Part No.	ERIE Part No.	MALLORY Part No.	SPRAGUE Part No.	NOTES
C6	33		62-0334090U1	SI33	D6-330	TP2T	GPIK-330	UC-5433	5GA-Q33	
C7	100		30-1245-6							
C8	150		62-1330G001	SI330	D6-331	TP39	GPIK-331	UC-5333	5GA-T33	
C9	150		62-1150H001	SI150	D6-151	TP36	GPIK-151	UC-5315	5GA-T15	
C10	150		62-1150U001	SI150	D6-151	TP36	GPIK-151	UC-5315	5GA-T15	
C11	.5-3		31-6520-2		829-3		3115-01-UOR5	CT565A		
C12	.62		30-1233-1							
C13	3		30-1234-71	NPO-SI1	TC2-1	T203	NPOA-010		5TCCB-V1	
C14	3.3		30-1234-114	NPO-SI3.3	TC2-3R3	TT06	NPOA-3R3	ST-5533	5TCCB-V33	
C15	15		30-1234-113	SI15	D6-150	TP31	GPIK-150	UC-5415	5GA-Q15	
C16	150		62-1500J001	BPD-00015	DD-151	G045	SIL-150	UC-5315	5GA-T15	
C17	27		30-1234-126		TC2-27		NPOL-270			
C18	3-3		31-6520-3		829-3		3115-01-UOR5	CT565A		
C19	1.5		30-1234-127							
C20	2.2		30-1234-127	NPO-SI2.2	TC2-2R2	TT06	NPOA-2R2 N330K-130		5TCCB-V22	
C21	12		30-1256				N330K-130			
C22	12		30-1255							
C23	330		62-1330G001	SI330	D6-331	TP39	GPIK-331		5GA-T33	
C24	1000		30-1245-6							
C25	5		30-1234-26	NPO-SI5	TC2-4R7	TZ07	NPOA-050	ST-555	5TCCB-V47	
C26	10000		30-1238-3	BPD-01	DD-103	K083	SIL-01	DC-511	5HK-S1	
C27	680		62-1680U011	SI680	D6-681	TP50	GPIK-681	UC-5368	5GA-T68	
C28	1000		30-1245-6							
C29	1000		30-1245-6							
C30	1-5		31-6520-9		839-5					
C31	1-5		31-6520-9		839-5					
C32	5		30-1234-26	NPO-SI5	TC2-4R7		NPOA-050	ST-555	5TCCB-V47	
C33	2000		30-1238-12	BPD-002	DD-202	K072	801-002	DC-523	5HK-D2	
C34	680		62-1680U011	SI680	D6-681	TP50	GPIK-681	UC-5368	5GA-T68	
C35	2000		30-1238-12	BPD-002	DD-202	K072	801-002	DC-523	5HK-D2	
C36	680		62-1680U011	SI680	D6-681	TP50	GPIK-681	UC-5368	5GA-T68	
C37	2000		30-1238-12	BPD-002	DD-202	K072	801-002	DC-523	5HK-D2	
C38	680		62-1680U011	SI680	D6-681	TP50	GPIK-681	UC-5368	5GA-T68	
C39	2000		30-1238-12	BPD-002	DD-202	K072	801-002	DC-523	5HK-D2	
C40	2000		30-1238-12	BPD-002	DD-202	K072	801-002	DC-523	5HK-D2	
C41	.75		30-1234-102		829-5					
C42	1-5		30-6520-9							
C43	5		30-1234-26	NPO-SI5	TC2-4R7	Z011	NPOA-050	ST-555	5TCCB-V47	
C44	10		62-0106090U1	SI10	D6-100	TP09	GPIK-100	UC-541	5GA-Q1	
C45	.1	200	30-6650-47	P288N-1	DF-104	CUBP2P1		PT401	2TM-P1	
C46	.047	200	30-6650-45	BPD-05	DD-473	CUBP2R47		PT417	2TM-S47	
C47	2000		30-1238-12	BPD-002	DD-202	K072	801-002	DC-523	5HK-D2	
C48	68		62-0684090U1	SI68	D6-680	TP32	GPIK-680	UC-5468	5GA-Q68	
C49	68		62-0684090U1	SI68	D6-680	TP32	GPIK-680	UC-5468	5GA-Q68	
C50	.1	400	30-6650-47	P488N-1	DF-104	CUBP4P1		PT401	4TM-P1	
C51A	7000		30-1239-10	BPD-0822	DD-852	T295	SIL-D852		5HK-D68	
B	470			SI470	D6-471	TP46	831-471		5GA-T47	
C52	10000		30-1238-2	BPD-01	DD-103	K087	SIL-01	DC-511	5HK-S1	
C53	.22	200	30-6650-49	P228N-22		CUBP22		PT4022	2TM-P22	
C54	2.2		30-1251-6	NPO-SI2.2	TC2-2R2	TZ05	NPOA-2R2		5TCCB-V22	
C55	12		62-0120Y001		TC2-12	T230	NPOK-120			
C56	2000		30-1238-12	BPD-002	DD-202	K072	801-002	DC-523	5HK-D2	
C57	5000		30-1238-7	BPD-005	DD-502	K080	SIL-005	DC-535	5HK-D5	
C58	390	500	62-0395A07	1468-50039	DF-391	SR5T39	SIL-391	MC3543	MS-339	
C59A	1500		30-1239-6	BPD-2X0015	DD2-152	DK07I	SI2-001S	DCD-5215	5HK-D215	
B	1500									
C60	5000		30-1238-1	BPD-005	DD-502	K080	SIL-005	DC-535	5HK-D5	
C61	3300		30-1238-17	BPD-0033	DE-332	K077	SIL-0033	DC-5333	5HK-D33	
C62	10000		30-1238-2	BPD-01	DD-103	K083	SIL-01	DC-511	5HK-S1	
C63	10000		30-1238-2	BPD-01	DD-103	K083	SIL-01	DC-511	5HK-S1	

PARTS LIST AND DESCRIPTIONS

CAPACITORS (cont)

ITEM No.	RATING: CAP.	VOLT	REPLACEMENT DATA: PHILCO Part No.	AEROVOX Part No.	CENTRALAB Part No.	CORNELL-DUBILIER Part No.	ERIE Part No.	MALLORY Part No.	SPRAGUE Part No.	NOTES
C64	470		62-1474U011	SI470	D6-471	TP45	GPIK-471	UC-5347	5GA-T47	
C65	150		62-1150G001	SI150	D6-151	TP36	GPIK-151	UC-5315	5GA-T15	
C66A	3500		30-1239-8	SI3500	D6-352	TP58	GP3-333-352	UC-5235	5HK-D35	
B	330			SI330	D6-331	TP43	GPIK-331	UC-5333	5GA-T33	
C67	.0068	400	30-6650-57	SI6800	D6-682	CUBS6S8	GP3-333-682	PT401	6TM-P1	
C68	.1	600	30-6650-47	P488N-1	DF-104	CUBP4P1		PT401	4TM-P1	
C69	.1	600	30-6650-47	P488N-1	DF-104	CUBP4P1		PT401	4TM-P1	
C70	68		62-0684090U1	SI68	D6-680	TP32	GPIK-680	UC-5468	5GA-Q68	
C71	500	500	60-1825S3 ①	1469-00003 ①	D6-501	SR5T53	SIL-501		MS-350	
C72	1000		30-1238-3	BPD-001	DD-103		SIL-01		5HK-S1	
C73	.001	400	30-6650-53	SI1000	D6-102	CUBS1S	GP2L-102	PT501	6TM-D1	
C74	1000		30-1238-3	BPD-001	DD-103	K083	SIL-01	DC-511	5HK-S1	
C75	10000		30-1238-3	BPD-01	DD-103	K083	SIL-01	DC-511	5HK-S1	
C76	3300	500	60-2025S434	1464-00323		SR5D33			MS-333	
C77	83	500	60-0083S437	1469-000083	D6-830	SR5G83	SOL-830		MS-482	
C78	390	500	60-1039S437	1469-00039	D6-391	SR5T39	SIL-391	MC3543	MS-339	
C79	390	500	60-1039S411	1469-00039	D6-391	SR5T39	SIL-391	MC3543	MS-339	
C80	560	500	60-1056S307	1469-00056	D6-561	SR5T56	SIL-561	DC-5356	MS-356	
C81	10000		30-1238-2	BPD-01	DD-103	K083	SIL-01	DC-511	5HK-S1	
C82	10000		30-1238-2	BPD-01	DD-103	K083	SIL-01	DC-511	5HK-S1	
C83	.047	600	30-6650-52	BPD-05	DF-503	CUBS4S7		PT5147	5TM-S47	
C84	82	4000			DD60-820					
C85	.01	600	30-6650-58	BPD-01	D6-103	CUBS6S1	GP3-333-103	PT501	6TM-S1	
C86	.01	600	30-6650-58	BPD-01	D6-103	CUBS6S1	GP3-333-103	PT501	6TM-S1	

CONTROLS

ITEM No.	RATING: RESISTANCE	WATTS	REPLACEMENT DATA: PHILCO Part No.	CENTRALAB Part No.	CLAROSTAT Part No.	IRC Part No.	MALLORY Part No.	INSTALLATION NOTES
R1A	250KΩ	①	33-5566-51	AB-51	A47-250K-Z	Q13-130	U-44	Volume
B	Shaft		Not Req.	AK-3	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	KB-1	SWE-12	76-1	US-26	Attach to R1A
R2A	15KΩ	①	33-5572-15	AB7-154		Q13-115X		Contrast tapped @ 10KΩ
B	Shaft		Not Req.	AK-1		Not Req.		Attach to R2A
R3A	100KΩ	①	33-5572-10	B-40	A47-100K-B	Q11-135	TA15L	Brightness - Note 1
B	Shaft		Not Req.	AK-1	FS-3	Not Req.	TA-151.	Attach to R3A
R4A	1Meg	①	33-5572-10	B-69	A47-1Meg-B	Q11-137	TA-151.	Vert. hold
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R4A
R5A	50KΩ	①	33-5572-9	B-31	A47-50K-B	Q13-133	TA4L	Horiz. hold
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R5A
R6A	1Meg	①	33-5572-8	RK-69	A47-1Meg-B	Q11-137	TA15L	Vert. linearity
B	Shaft		Not Req.	Not Req.	FKS-1/2	RQ	Not Req.	Attach to R6A
R7A	2.5Meg	①	33-5572-1	HX-83	A47-2.5Meg-B	Q11-239	TA3501.	Height
B	Shaft		Not Req.	Not Req.	FKS-1/2	RQ	Not Req.	Attach to R7A
R8	12.5MΩ	②	33-5575	VK-157		W7K12.500	BI5AL	Width (wire wound)
R9A	350KΩ	①	33-5572	AB-50	A47-350K-U	Q11-150	TA3541.	Horiz. Osc.
B	Shaft		Not Req.	AK-1	FKS-1/2	RQ	Not Req.	Attach to R9A

Note 1. Part number 33-5562-16 used in some versions.

RESISTORS

ITEM No.	RATING: OHMS	WATT	REPLACEMENT DATA: PHILCO Part No.	NOTES
R10	470KΩ	½	66-4478340	
R11	150KΩ	½	66-4158340	
R12	82KΩ	½	66-4828340	BTB-33K
R13	470KΩ 5%	½	66-4478340	BTB-470K 5%
R14	470KΩ 5%	½	66-4478340	BTB-470K 5%
R15	180KΩ	½	66-4184340	
R16	68Ω	½	66-3168340	
R17	150KΩ	½	66-4158340	BTB-150K
R18	270KΩ	½	66-4278340	
R19	1.5Meg	½	66-4158340	BTB-1.5Meg
R20	10Meg 5%	½	66-4108340	BTB-10Meg 5%
R21	33KΩ	½	66-3328340	
R22	47KΩ	½	66-3478340	BTA-47K
R23	47KΩ	1		
R24	82000Ω	2	66-3825340	
R25	820Ω	½	66-3828340	
R26	220Ω	2	66-1228340	BTB-220
R27	2.2Meg	½	66-5228340	BTB-2.2Meg
R28	1.5Meg 5%	½	66-5158340	BTB-1.5Meg 5%
R29	10Meg 5%	½	66-5108340	BTB-10Meg 5%
R30	15KΩ	½	66-3158340	BTB-15K
R31	10000Ω	½	66-2108340	BTB-100O
R32	330Ω	½	66-1338340	BTB-330
R33	47Ω	½	66-0478340	BTB-47
R34	47KΩ	½	66-3478340	
R35	330Ω	½	66-1338340	BTB-330
R36	47Ω	½	66-0478340	BTB-47
R37	470Ω	½	66-1478340	BTB-470
R38	120Ω	½	66-1228340	BTB-220
R39	3900Ω	½	66-2398340	BTB-3900
R40	470KΩ	½	66-4478340	BTB-470K
R41	6.8Meg	½	66-5688340	BTB-6.8Meg
R42	4.7Meg	½	66-5478340	BTB-4.7Meg
R43	2700Ω	½	66-2278340	BTB-2700
R44	470KΩ	½	66-4478340	BTB-470K
R45	1Meg	½	66-5108340	BTB-1Meg
R46	130KΩ	½	66-4134340	BTA-130K
R47	5600Ω	7	33-1335-154	
R48	10KΩ	½	66-1038340	BTB-10O
R49	56KΩ	½	66-3568340	BTB-56K
R50	56KΩ	½	66-3568340	BTB-56K
R51	2200Ω	½	66-2228340	BTB-2200
R52	150KΩ	½	66-4158340	BTB-150K
R53	33KΩ	½	66-3338340	BTB-33K
R54	6800Ω	½	66-2688340	BTB-6800
R55	27KΩ	½	66-3278340	BTB-27K

ITEM No.	RATING: OHMS	WATT	REPLACEMENT DATA: PHILCO Part No.	IRC Part No.	NOTES
R56	330Ω	½	66-1338340	BTB-330	
R57	22KΩ	½	66-3228340	BTB-22K	
R58	27KΩ	½	66-3278340	BTB-270	
R59	47KΩ	½	66-3478340	BTB-47K	
R60	100KΩ	½	66-4108340	BTB-100K	
R61	10Meg	½	66-5108340	BTB-10Meg	
R62	270KΩ	½	66-4278340	BTB-270K	
R63	1.5Meg	½	66-5158340	BTB-1.5Meg	
R64	1Meg	½	66-5108340	BTB-1Meg	
R65	330Ω	½	66-1338340	BTA-330	
R66	15KΩ	2	66-3155340	BTB-15K	
R67	220KΩ	½	66-4228340	BTB-220K	
R68	100KΩ	½	66-4108340	BTB-100K	
R69	150KΩ	½	66-4158340	BTB-150K	
R70	82000Ω	½	66-2828340	BTB-820O	
R71	15KΩ	½	66-3158340	BTB-15K	
R72	33KΩ	½	66-3338340	BTB-33K	
R73	470KΩ	½	66-4478340	BTB-470K	
R74	2.2Meg	½	66-5228340	BTB-2.2Meg	Note 1
R75	470KΩ	½	66-4478340	BTB-470K	Note 3
R76	470KΩ	½	66-4478340	BTB-470K	
R77	470KΩ	½	66-4478340	BTB-470K	
R78	15KΩ	½	66-3158340	BTB-15K	
R79	22KΩ	2	66-3225340	BTB-22K	
R80	330Ω	½	66-1334340	BTA-330	
R81	1000Ω	½			
R82	1000Ω	½			
R83	680KΩ	½	66-4688340	BTB-470K	
R84	180KΩ	½	66-4188340		
R85	4.7Meg	½	66-5478340		
R86	8200Ω	½	66-2828340		
R87	15KΩ	½	66-3158340		
R88	15KΩ	½	66-3158340	BTB-100O	
R89	56KΩ	½	66-3568340		
R90	8200Ω	½	66-2828340		
R91	39KΩ	½	66-3398340	BTB-39K	
R92	4700Ω	½	66-2478340	BTB-4700	
R93	470KΩ	½	66-4478340	BTB-470K	
R94	1Meg	½	66-5108340	BTB-1Meg	
R95	330Ω	½	66-1334340	BTA-330	
R96	8200Ω	½	66-2828340		
R97	47KΩ	½	66-3474340	BTA-47K	
R98	15KΩ	9	66-3158340		
R99	100KΩ	2	66-4105340	BTB-100K	
R100	4700Ω	½	66-2478340	BTB-4700	
R101	820Ω	½	66-1824340	BTA-820	
R102	100KΩ	2	66-4105340	BTB-100K	Note 3

Note 1. Some versions use a 1.2Meg ½ watt resistor in this application.
Note 2. Run 1 use a 680KΩ, ½ watt resistor in this application.
Note 3. Not used in Run 1 chassis.

TRANSFORMER (POWER)

ITEM No.	RATING: PRI.	SEC. 1	SEC. 2	SEC. 3	REPLACEMENT DATA: PHILCO Part No.	Halldorson Part No.	Merit Part No.	Stancor Part No.	Thordarson Part No.	Triad Part No.
T1	117VAC ②1.66A	525VAC ②.250A	6VAC ③A	6.3VAC ③10A	32-8690			P6172	26B23	

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA: PHILCO Part No.	Halldorson Part No.	Merit Part No.	RCA TYPE No.	Ram Part No.	Stancor Part No.	Thordarson Part No.	Triad Part No.
T2	Vert.Osc. Trans.	32-8676-1	B8705 ①	A-3004 ①		V404 ①	A-8129 ①	26A09 ①	A-102 ①
T3	Horiz. Output Trans.	32-8665-2 32-8691 ③	FB419 * ①	EVO-36 * ②	2367T * ③	X094 * ③	A-8253 * ③	FLY-18 * ③	D-50 * ③
T4	Vert. Output Trans.	32-8637	Z1900 ①						
T5A	Yoke(90°)Horiz. (52mH) Vert.(44mH)	32-8686-2 ① 32-8692 ①							Y-16 ① Y-17 ①
B									

① Mount on top of chassis.
② Connect red lead to yellow lead, then connect blue lead to ground, red and yellow leads to cathode, green lead to grid capacitor.
③ Drill new mounting hole(s).
④ Alternate Philco part number.
⑤ Use 6 to 1 turns ratio.
⑥ Connect as auto transformer.
⑦ Includes resistors R81, R83.
⑧ Connect horizontal damping capacitor across terminals #3 and #7. Then connect terminal #3 to plug pin #8, terminal #1 to plug pin #9, terminal #2 or #7 to plug pin #3.
⑨ Use original yoke damping network if necessary.
⑩ Use original core clamp.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type is Listed

ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
12	9	9	9	9	8	9	9
2	7	7	7	7	1	7	7
6	NC Sec Note ⑪	NC Sec Note ④	NC Sec Note ④	NC Sec Note ⑪	NC Sec Note ④	NC Sec Note ⑪	NC Sec Note ⑪
1	1	1	1	1	4	1	1

⑪ Connect R86 in series with C84 across yoke terminals #1 and #2. (Yoke socket pins #5 and #3.)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	SEC.	REPLACEMENT DATA: PHILCO Part No.	Halldorson Part No.	Merit Part No.	Thordarson Part No.	Triad Part No.	NOTES
T6	2.4KΩ	3.4Ω	32-8674	Z1101	A-3025	A-3332	26B58 ①	S-12X ① Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS: SIZE	FIELD	V. C. IMP	REPLACEMENT DATA: PHILCO Part No.	CHAM Part No.	RCA TYPE No.	NOTES
SP1	6"	PM	3.4Ω	36-1641-6 ①	6A1	22S01	① Used in Model 24C6105M
	8"	PM	3.4Ω	36-1651-5 ②	8A31	21S81	② Used in Model 24C6106
	6"	PM	3.4Ω	45-9735 ③	6A1	22S81	③ Used in Model 24C6005

COILS (RF-IF)

ITEM No.	USE	DC RES.: PRI.	SEC.	REPLACEMENT DATA: PHILCO Part No.	MEISSNER Part No.	MERIT Part No.	MILLER Part No.	NOTES
L1	VHF Ant. Match. Trans.	.7Ω	.7Ω	32-4432-3				
L2	VHF Ant. Match. Trans.	.7Ω	.7Ω	32-4432-3				
L3	IF Amp	0Ω		32-4552-1				Wound on 22MMF mica cap.
L4	VHF Ant. Coil	0Ω		76-9245				Part of complete assy. - Channel 13
L5	VHF Ant. Coil	0Ω		76-9245				Part of complete assy. - Channel 8
L6	VHF Ant. Coil	0Ω		76-9245				Part of complete assy.
L7	UHF IF Coil	0Ω		33-4533-55				
L8	UHF IF Coil	0Ω		33-4533-56				
L9	UHF IF Coil	0Ω		33-4533-57				
L10	VHF RF Coil	0Ω		76-9349				Part of complete assy. - Channel 13
L11	VHF RF Coil	0Ω		76-9349				Part of complete assy. - Channel 8
L12	VHF RF Coils	0Ω		76-9349				Part of complete assy.
L13	UHF IF Coil	0Ω		76-9349				Part of complete assy.
L14	VHF Mixer Grid Coil	0Ω		76-9327				Part of complete assy. - Channel 13
L15	VHF Mixer Grid Coil	0Ω		76-9327				Part of complete assy. - Channel 8
L16	VHF Mixer Grid Coils	0Ω		76-9327				Part of complete assy.
L17	UHF IF Coil	0Ω		76-9327				Part of complete assy.
L18	VHF Osc. Coil	0Ω		76-9231				Part of complete assy. - Channel 13
L19	VHF Osc. Coil	0Ω		76-9231				Part of complete assy. - Channel 8
L20	VHF Osc. Coils	0Ω		76-9231				Part of complete assy.
L21	RF Coil	0Ω		32-4523-57				
L22	Conv. Plate	.1Ω		32-4529-1				Tapped
L23	1st. Video IF	.1Ω		32-4597-3	19-3001	TV-189	6175	.84 Microhenry
L24	47.25MC Trap	.1Ω		32-4597-3	19-1000		6804	1.2 Microhenries
L25	2nd. Video IF	.1Ω	.1Ω	32-4686-45			6319	
L26	FIL. Choke	.1Ω		32-4123-49	19-1002		6804	2 Millicrohenries
L27	3rd. Video IF	.1Ω	.1Ω	32-4686-46	17-4533		6319	
L28	4th. Video IF	.1Ω	.1Ω	32-4686-47	17-4534		6319	

PHILCO MODELS 24C6005, 24C6105M, 24C6106 (CH. TV304)

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA PHILCO PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L29	47.25MC Trap	.1Ω		32-4597-2	19-1000		4604	1.2 Microhenries
L30	Series Peaking Coil	2.4Ω		32-4630	19-6022		6152	22 Microhenries
L31	Shunt Peaking Coil	6.2Ω		32-4480-5	19-3250	TV-185	6181	250 Microhenries
L32	Series Peaking Coil	1.5Ω		32-4112-52	19-1003		4606	3 Microhenries
L33	Series Peaking Coil	6.5Ω		32-4480-18	19-3160	TV-184	4644	150 Microhenries
L34	4.5MC Trap	1.8Ω		32-4463-11				
L35	Shunt Peaking Coil	6.2Ω		32-4480-5	19-3250	TV-185	6181	250 Microhenries
L36	Series Peaking Coil	7Ω		32-4480-4	19-4400		6136	400 Microhenries
L37	Sound IF	4.2Ω		32-4463-14				
L38	RF Coil	1.5Ω		32-4112-52	19-1003		4606	3 Microhenries
L39	Ratio Det.	7.8Ω	1.1ΩCT	32-4631A	17-3497	TV-115	6205	Tertiary winding-1.3Ω
L41	RF Choke	2Ω		32-4112-50	19-1006		4624	15 Microhenries
L42	RF Choke	2Ω		32-4112-50	19-1006		4624	15 Microhenries
L43	RF Choke	2Ω		32-4112-50	19-1006		4624	15 Microhenries

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA PHILCO PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	RCA TYPE No.	Ram PART No.	Thordarson PART No.	NOTES
L40	160Ω		32-4557-4			6319				

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D. C. RESISTANCE	RATINGS INDUCTANCE (0 CURRENT 1000 ∿)	REPLACEMENT DATA PHILCO PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L44	.250ADC	72Ω	1.4 Hy.	32-8693	C5031 ①	C2996 ①	C2327 ①	26C41	C-23X ①

① Drill one new mounting hole.

FUSES

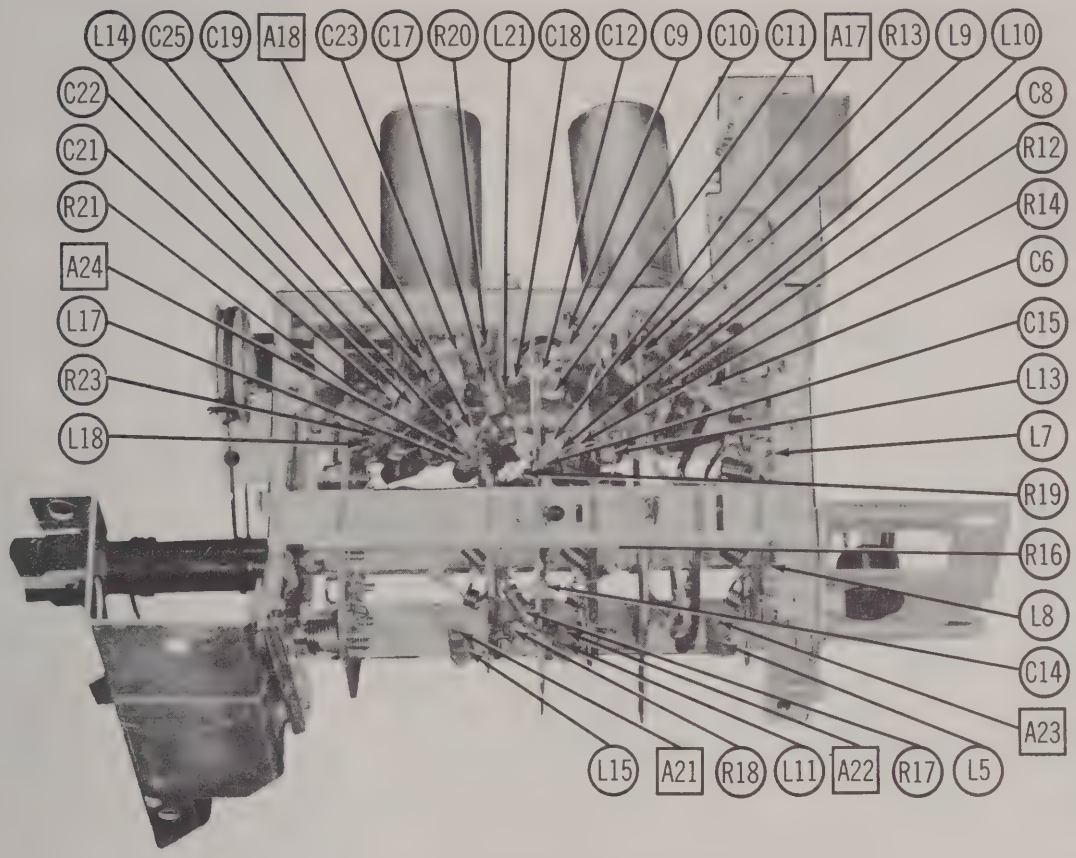
ITEM No.	TYPE	RATING	REPLACEMENT DATA PHILCO PART No. FUSE	PHILCO PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M1	3AG S/B	7/10A 250V	45-2656-22		313.750 (3AG S/B-3/4A)	357001	MDL 7/10	4405

CRYSTAL DIODES

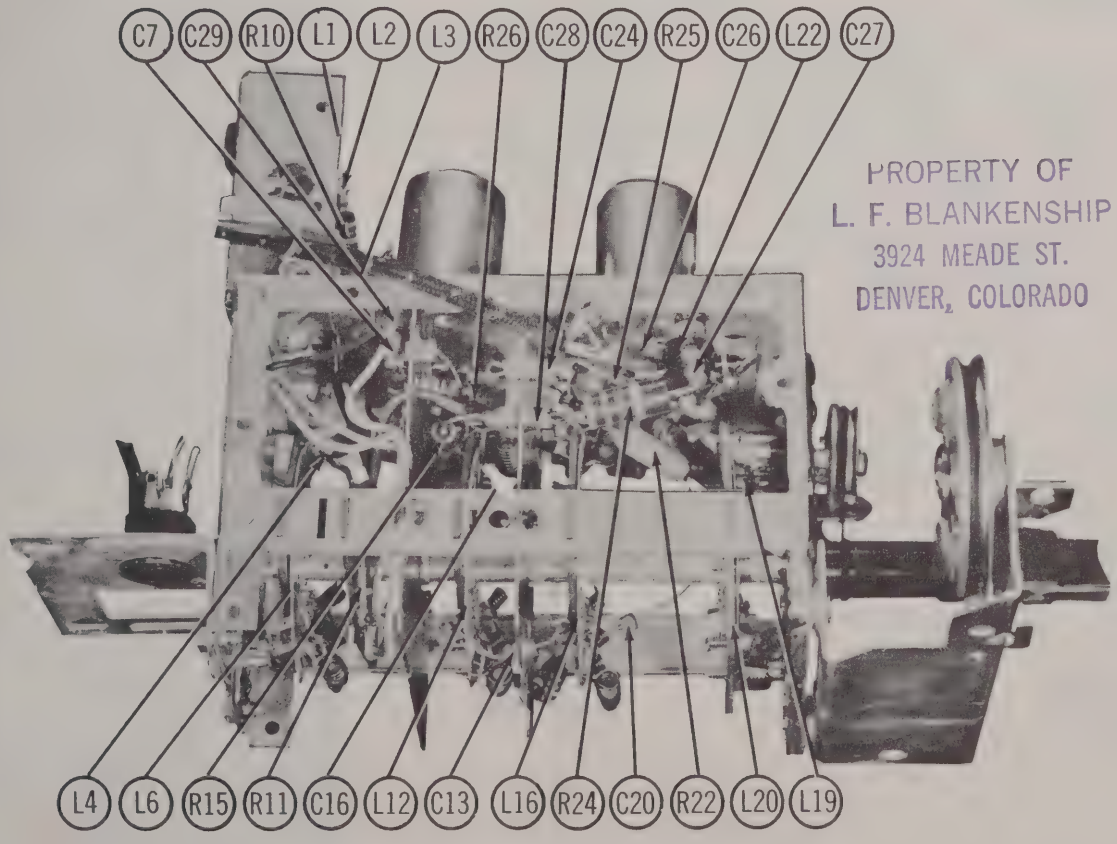
ITEM No.	ORIG. TYPE	REPLACEMENT DATA PHILCO PART No.	REPLACEMENT DATA SYLVANIA PART No.	NOTES
M2	1N60	34-8022-2	1N60	Video Detector (Pigtail)

MISCELLANEOUS

ITEM No.	PART NAME	PHILCO PART No.	NOTES
M3	Dial Light	3463-4	#1847
M4	Tuner	76-8946-1	VHF - T36A, used in Runs 1, 2 and 3
	Tuner	76-8946-4	VHF - T36D, used in Runs 4 and on
M5	Switch	42-1979	Built-in antenna - used in model 24C6108
M6	Focus Magnet	76-9511	Includes centering device
M7	Ion Trap	76-6077-4	
M8	Correction Magnet	76-8474-1	
	Cabinet	11096-2	Model 24C6108
	Cabinet	11104-2	Model 24C6005
	Knob	54-6157	Brightness, contrast, horiz. hold, vert. hold
	Knob	76-9118-7	Channel selector
	Knob	76-6104-9	Fine tuning
	Knob	76-9237-1	On-off-volume
	Knob	76-7710	Built-in antenna. adjustment - Model 24C6108
	Dial & Film Assy.	76-9048	UHF
	Mask	54-9033-9	
	Safety Glass	54-9213-44	



RF TUNER-RIGHT SIDE



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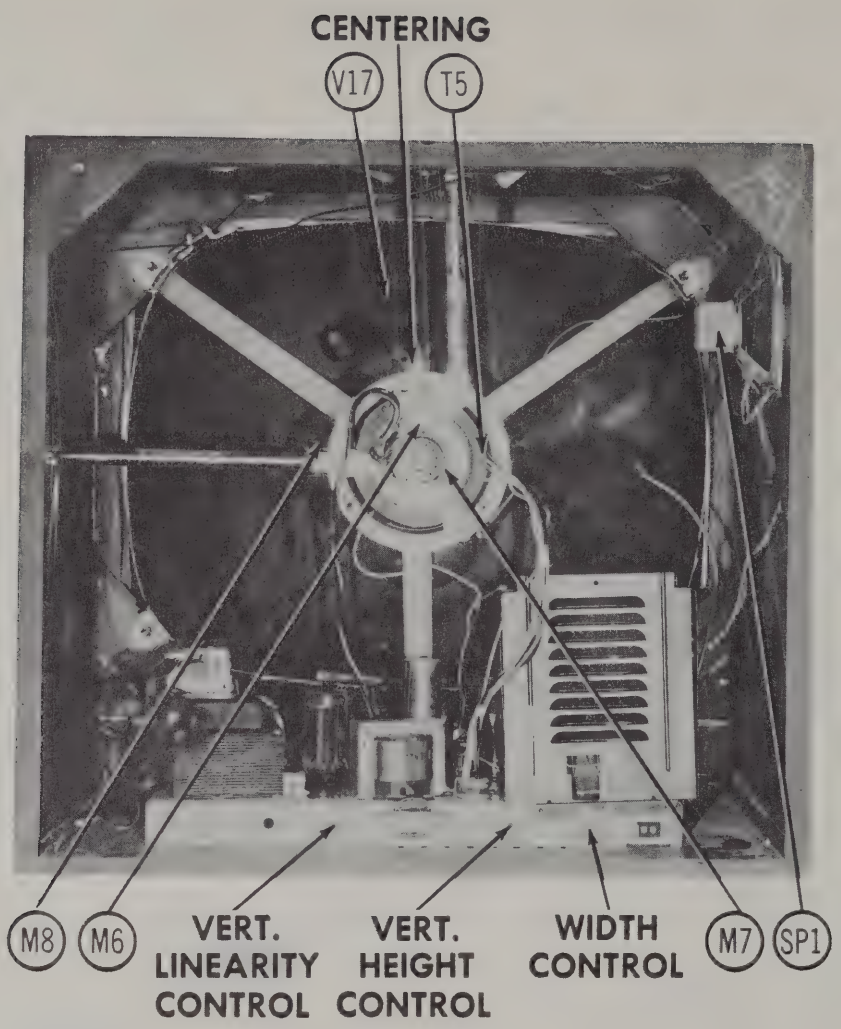
DENVER, COLORADO

RF TUNER-LEFT SIDE



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

① Turn contrast control down until blanking is visible.

② Set the horizontal hold control to center of its range.

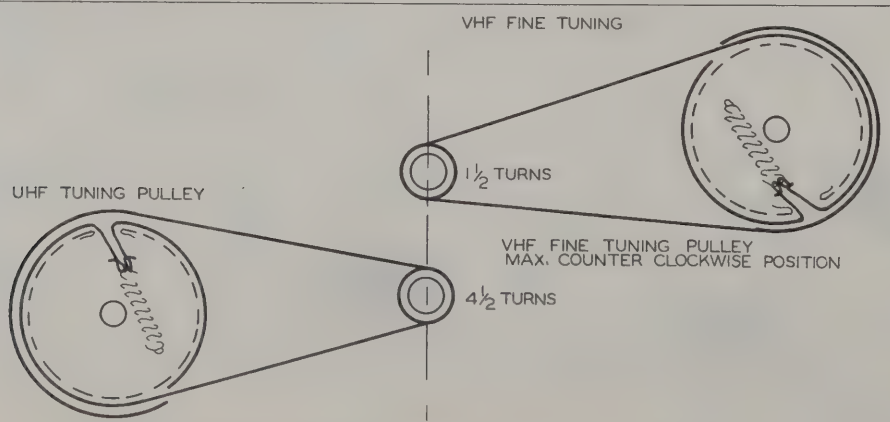
③ Short out horizontal oscillator coil (L40) by clipping a . 1MFD capacitor from point F to chassis.

④ Adjust horizontal oscillator control (R9) until equal blanking exists on each side of raster. This can be seen by decentering the picture, first to one side-then the other, by moving the wobble plate.

⑤ Remove the shorting capacitor.

⑥ Adjust the oscillator slug (B1) until picture is brought into sync with equal blanking on each side, The wobble plate is used as in step 4 above.

⑦ Check the pull-in by turning the horizontal hold control until the picture goes out of sync and then slowly bring the picture back into sync. This pull-in should occur between 2 1/2 to 3 bars. If pull-in is not correct repeat the above steps. Adjust the width control for a picture slightly wider than necessary to fill the picture mark horizontally.



UHF DRIVE CORD STRINGING

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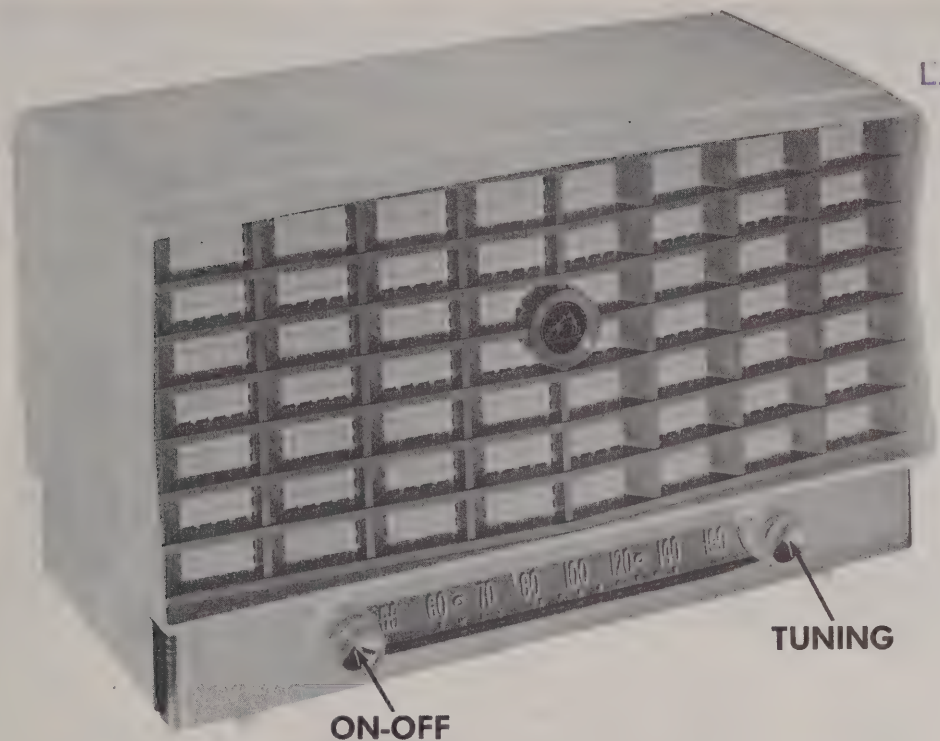
DENVER, COLORADO



RCA VICTOR MODEL
6-XD-5 (Ch. RC-1146A)

TRADE NAME	RCA Victor Model 6-XD-5 (Chassis RC-1146A)
MANUFACTURER	RCA Victor Radio & "Victrola" Div., Radio Corp. of America, Camden 2, N.J.
TYPE SET	AC-DC Operated AM Superheterodyne Receiver
TUBES (Five)	Types: 12BE6 Converter, 12BA6 IF Amp., 12AV6 Det.-AVC-AF Amp., 50C5 Output, 35W4 Rectifier
POWER SUPPLY	105-125 Volts AC-50-60 Cycles — RATING .25 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	540KC-1600KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.
Use isolation transformer, if available. If not, connect a .1MFD capacitor in series with low side of signal generator and B-.
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.01MFD	High side to pin 1 (grid) of 12BA6 (V2). Low side to chassis.	455KC (400%Mod)	Tuning gang fully open	Across voice coil	A1, A2	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.	"	High side to antenna stator lug on gang. Low side to chassis.	"	"	"	A3, A4	"
3.		Loop	1620KC	"	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
4.		"	1400KC	Tune to 1400KC signal	"	A6	"
5.		"	600KC	Tune to 600KC signal	"	A7	Adjust for maximum output while rocking tuning gang.

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: RCA Victor PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	Converter	12BE6	12BE6	7CH	
V2	IF Amplifier	12BA6	12BA6	7BK	
V3	Det.-AVC-AF Amp.	12AV6	12AV6	7BT	
V4	Audio Output	50C5	50C5	7CV	
V5	Rectifier	35W4	35W4	5BQ	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING: CAP.	RATING: VOLT.	REPLACEMENT DATA: RCA Victor PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	50	150	76718	PRS150V30-50	BBRD5315	TCD497	TDL-5030-150	MTD-301	
B	30	150							

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: RCA Victor PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C2	.047	400	73553	BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C3	56		75784	NP0-S156	TCZ-56		NP0-337-560		5TCC-Q56	
C4A	220		♦79058	♦PA-113-2	♦PC-151	♦116TM2	♦1408-02		♦DT-2	
B	5000									
C	5000									
D	250									
E										
C5	.015	400	73797	BPD-015	DD16-153	CUB6S15	821-015	PT6115	6TM-S15	
C6	.047	400	75071	BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C7	.1	400	73551	P488N-1	DF-104	CUB4P1		PT401	4TM-P1	

♦ Items C4A, C4B, C4C, C4D, C4E, R7A, R7B and R7C are combined in one unit. When replacing items separately, C4D and C4E should total 250MMF.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: RCA Victor PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	500KΩ	½	100656	B-60-S	A47-500K-Z	Q13-133	U-48	Volume
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	Not Req.	SWE-12	76-1	US-26	Attach to R1A

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: RCA Victor PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R2	33KΩ	½	503333	BTS-33K	
R3	100Ω	½	503110	BTS-100	
R4	100Ω	½	503110	BTS-100	
R5	3.3Meg	½	503533	BTS-3.3Meg	
R6	47KΩ	½	503347	BTS-47K	

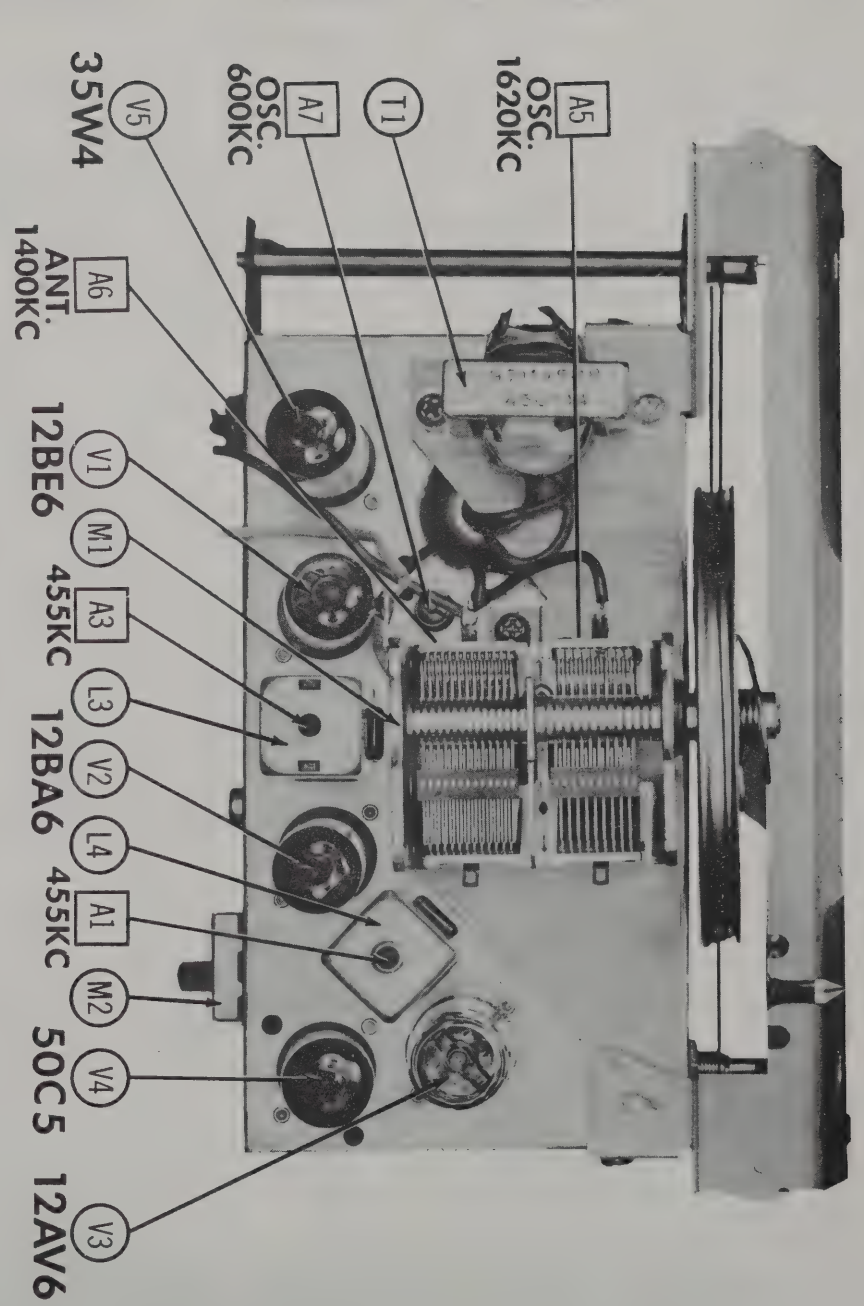
ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: RCA Victor PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R7A	6.8Meg	½	♦79058	BTS-6.8Meg	
B	470KΩ	½		BTS-470K	
C	470KΩ	½		BTS-470K	
R8	1200Ω	1	512212	BTA-1200	
R9	150Ω	½	502115	BTS-150	
R10	33Ω	1	513033		

♦ Items R7A, R7B, R7C, C4A, C4B, C4C, C4D, C4E are combined in one unit.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	IMPEDANCE: SEC.	REPLACEMENT DATA: RCA Victor PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	2.4KΩ	1.65Ω	100661						

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	RCA Victor PART No.	QUAM PART No.	RCA TYPE No.	
SP1	4"	PM	3.3Ω	100660	4A07	223S1	
SP2	4"	PM	3.3Ω	100660	4A07	223S1	

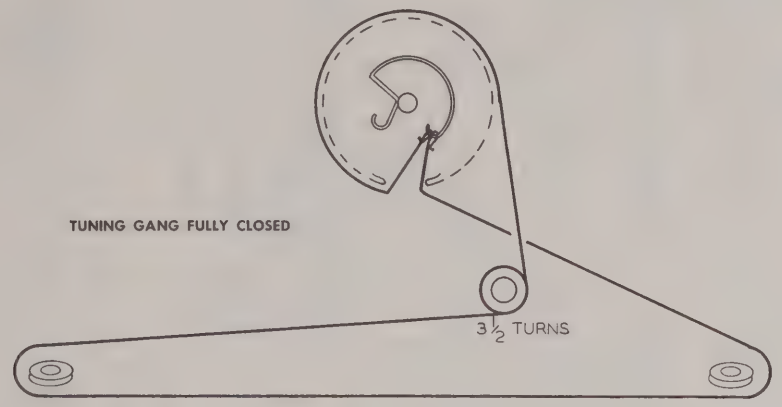
COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	RCA Victor PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Loop Ant.	3.6Ω		100659				Includes cabinet back
L2	Osc. Coil	.7Ω	5.3Ω	79057	14-1074 *	BC-381	71-OSC	
L3	Input IF	18Ω	18Ω	75486	16-6758	BC-352	12-C1	
L4	Output IF	15Ω	15Ω	75487	16-6770	BC-355	12-C6	

* Leads sufficient mounting support.

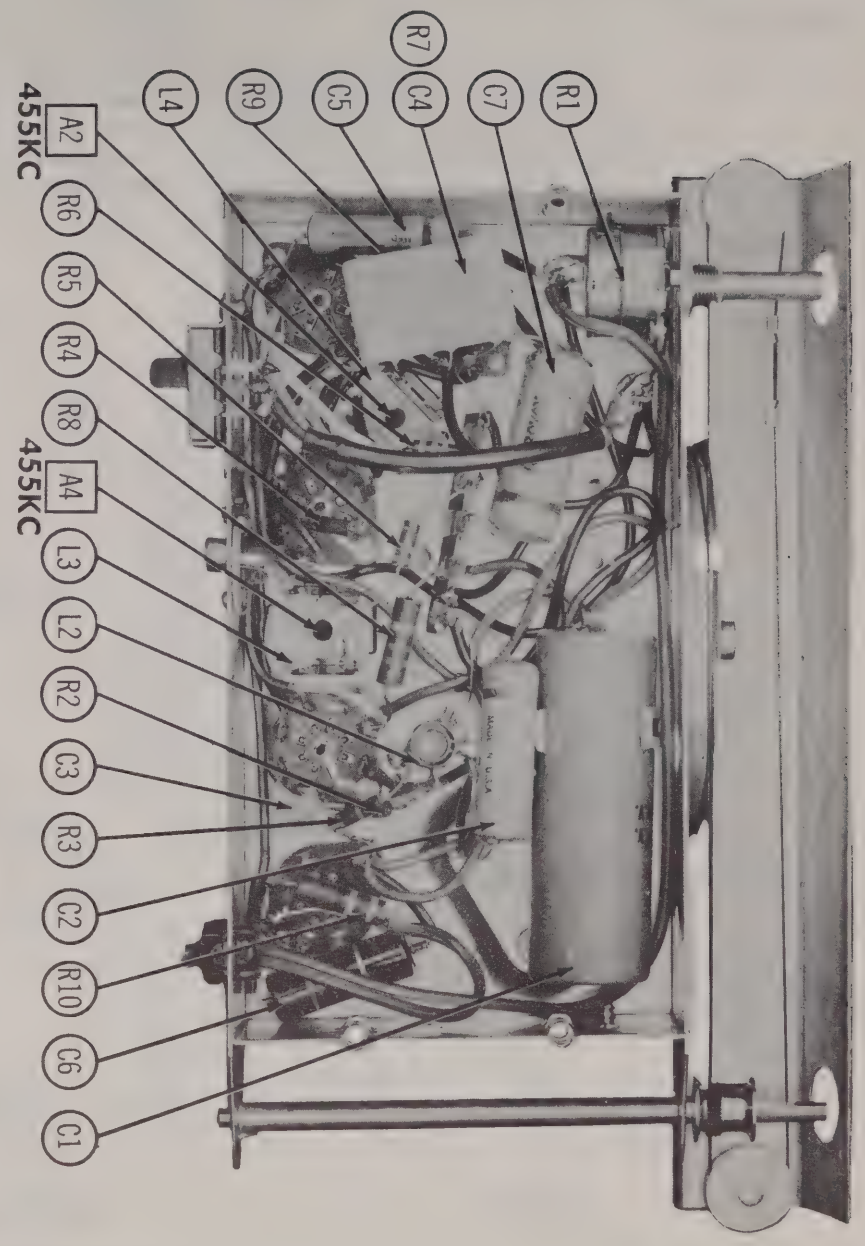
MISCELLANEOUS

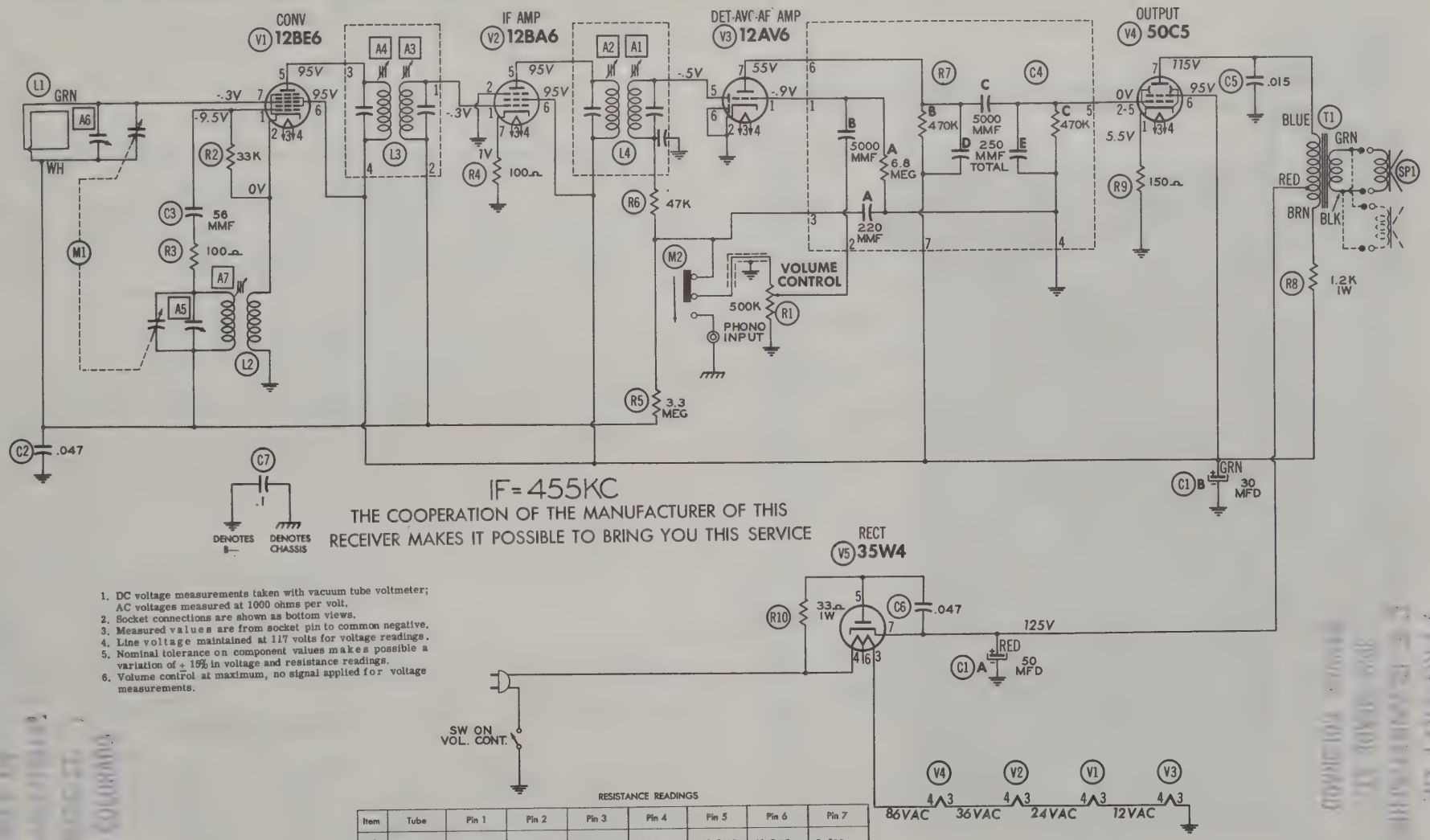
ITEM No.	PART NAME	RCA Victor PART No.	NOTES
M1	Tuning Cap.	100655	2 Gang (23-420MMF, 20-140MMF)
M2	Switch	79256	Radio-phono (SPDT-Slide type)
	Cabinet	Y2790	Light Gray
	Cabinet	Y2791	Light Green
	Cabinet	Y2847	Black
	Knob	79269	On-off-volume & station selector
	Pointer	100658	Station selector



DIAL CORD STRINGING

CHASSIS—BOTTOM VIEW





IF = 455KC

THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12BE6	22KΩ	.7Ω	12Ω	24Ω	†1.2KΩ	†1.2KΩ	3.8Meg
V 2	12BA6	3.8Meg	0Ω	24Ω	36Ω	†1.2KΩ	†1.2KΩ	100Ω
V 3	12AV6	6.8Meg	0Ω	0Ω	12Ω	547KΩ	0Ω	†471KΩ
V 4	50C5	150Ω	470KΩ	36Ω	86Ω	470KΩ	†1.2KΩ	†220Ω
V 5	35W4	TP	NC	86Ω	121Ω	154Ω	148Ω	90KΩ

ALL MEASUREMENTS TAKEN WITH RADIO-PHONO SWITCH IN RADIO POSITION.
† MEASURED FROM PIN 7 OF V5.
NC - NO CONNECTION.
TP-TIE POINT.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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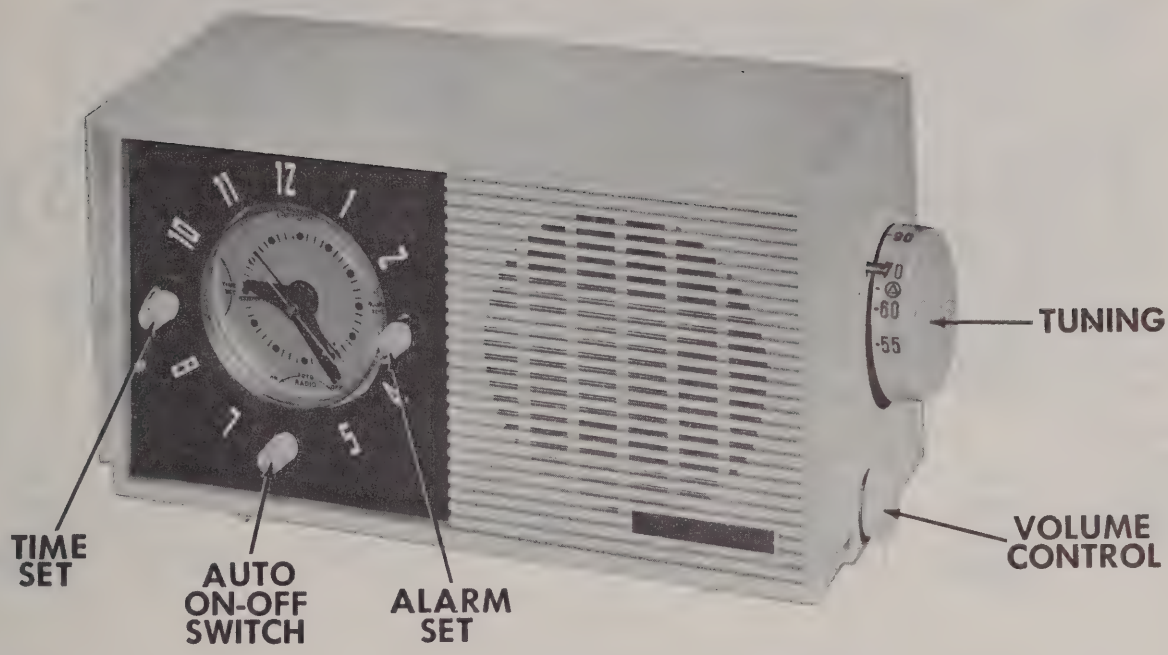
309-14

ROLAND
MODEL 5C5



ROLAND
MODEL 5C5

TRADE NAME	Roland Model 5C5
MANUFACTURER	Roland Radio Corp., 12-30 Anderson Ave., Mt. Vernon, N.Y.
TYPE SET	AC Operated AM Superheterodyne Receiver with Electric Clock
TUBES (Five)	Types 12BE6 Converter, 12BA6 IF Amp., 12AT6 Det.-AVC-AF Amp., 50C5 Output, 35W4 Rectifier
POWER SUPPLY	110-120 Volts AC-60 Cycles — RATING .25 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	540KC-1600KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.
Use isolation transformer, if available. If not, connect a .1MFD capacitor in series with low side of signal generator and B-.
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to pin 7 (grid) of 12BE6 (V1). Low side to chassis.	455KC (400~ Mod.)	Tuning gang fully open	Across Voice Coil	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.		Loop	1620KC	"	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	1400KC	Tune to 1400KC signal	"	A6	"

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PARTS LIST AND DESCRIPTIONS

ROLAND
Model 5C5

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		ROLAND PART No.	STANDARD REPLACEMENT		
V1	Converter	12BE6	12BE6	7CH	
V2	IF Amp.	12BA6	12BA6	7BK	
V3	Det. -AVC-AF Amp.	12AT6	12AT6	7BT	
V4	Output	50C5	50C5	7CV	
V5	Rectifier	35W4	35W4	5BQ	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	ROLAND PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	40	150		PRS150V8040-20	BBRT84215	TCT3117	TDL-804020-150	T-055	TVA-3455
B	80	150							
C	20	150							

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	ROLAND PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	10									
C3	.05	200		BPD-05	DF-503	CUB2S5		PT415	2TM-S5	
C4A	100		†	† PA-97-1	† PC-50	† 111TM1	† 1403-01	UC-531	† D-1	
B	100							UC-531		
C5A	220									Note 1
B	2000									
C	5000		♦	♦ PA-113-1	♦ PC-150	♦ 116TM1	♦ 1408-01		♦ DT-1	
D	250									
E										
C6	.01	400		BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C7	.01	600		BPD-01	D6-103	CUB6S1	GP3-333-103	PT611	6TM-S1	
C8	.1	400		P488N-1	DF-104	CUB4P1		PT401	4TM-P1	

Note 1. C5A is not used.
† Items C4A, C4B and R5 are combined in one unit.
♦ Items C5A, C5B, C5C, C5D, C5E, R6A, R6B and R6C are combined in one unit. When replacing items separately, C5D and C5E should total 250MMF.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	ROLAND PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	1Meg	½		AB-70	A47-1Meg-Z	Q13-137	U-53	Volume
B	Shaft			AK-4	KSS-3	Not Req.	Not Req.	Attach to R1A.

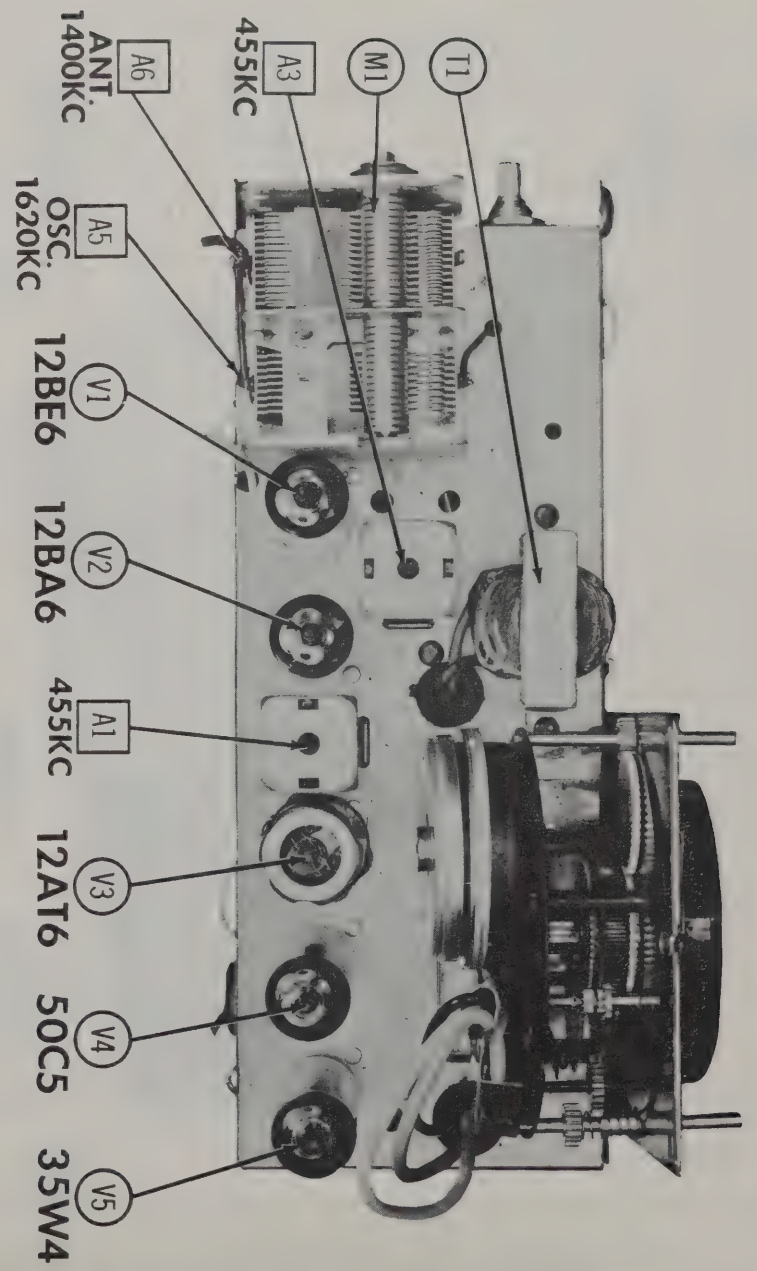
RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	ROLAND PART No.	IRC PART No.	
R2	22KΩ	½		BTS-22K	
R3	2.2Meg	½		BTS-2.2Meg	
R4	150Ω	½		BTS-150	
R5	47KΩ	½	†	BTS-47K	
R6A	6.8Meg	½		BTS-6.8Meg	
B	470KΩ	½	♦	BTS-470KΩ	
C	470KΩ	½		BTS-470KΩ	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	ROLAND PART No.	IRC PART No.	
R7	150Ω	1		BTA-150	
R8	330Ω	1		BTA-330	
R9	2200Ω	1		BTA-2200	
R10	22Ω	1		BTA-22	

† Items R5, C4A, C4B are combined in one unit.
♦ Items R6A, R6B, R6C, C5A, C5B, C5C, C5D, C5E are combined in one unit.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	ROLAND PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	2.6KΩ	3.5Ω		Z1101	A3025	A3332		S-12X	

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	ROLAND PART No.	QUAM PART No.	RCA TYPE No.	
SP1	4"	PM	3.5Ω		4A07	223S1	

COILS (RF-IF)

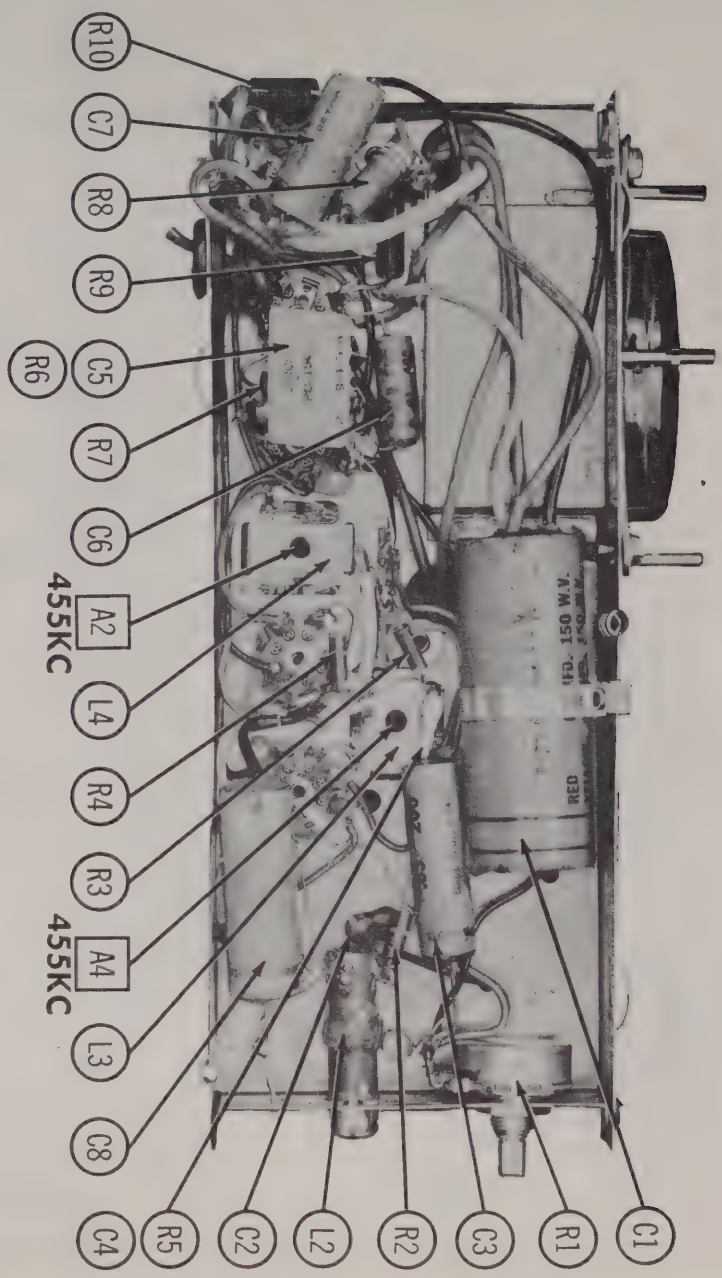
ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	ROLAND PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Loop Ant.	2.9Ω						Includes Cabinet Back
L2	Osc. Coil	.5Ω	5.5Ω		14-1073 *		69-Osc. ■	
L3	Input IF	23Ω	23Ω	LF-50	16-6758	BC-352	12-C1	
L4	Output IF	23Ω	23Ω	LF-50	16-6758	BC-353	12-C2	

* Leads sufficient mounting support.
■ Drill new mounting hole.

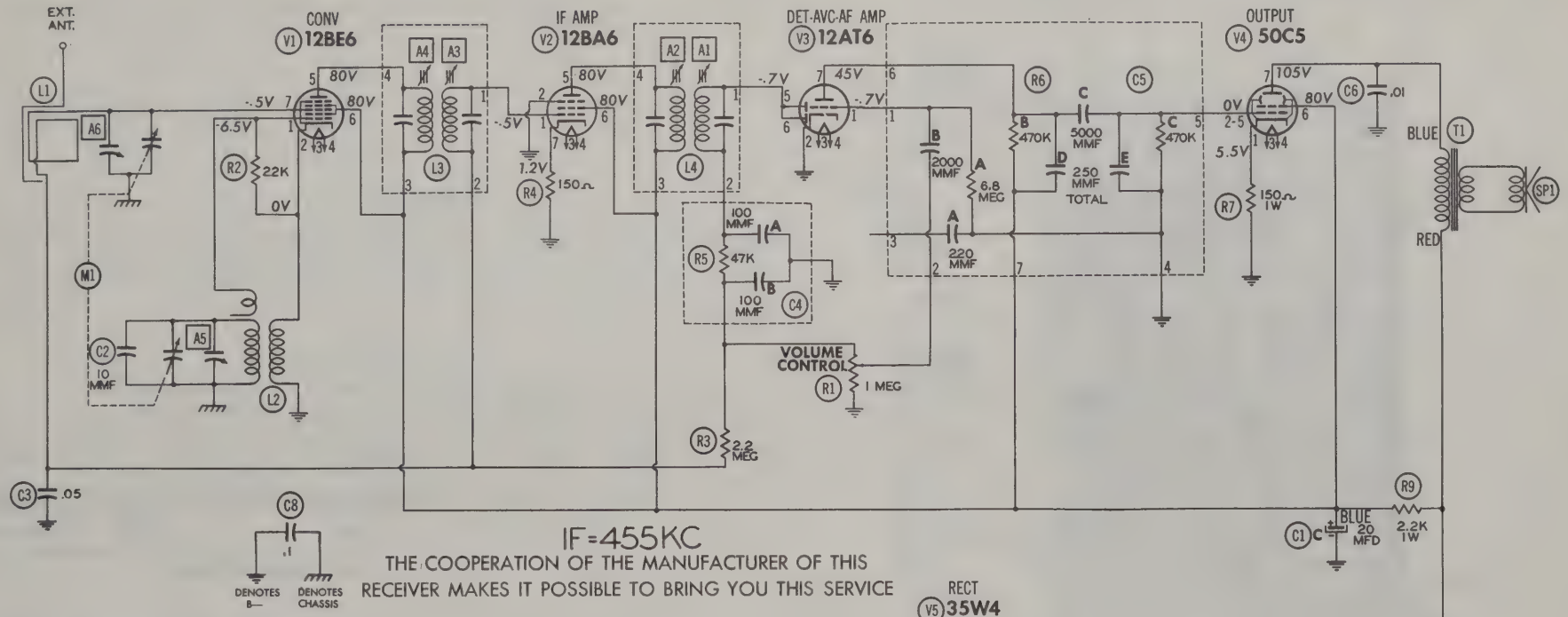
MISCELLANEOUS

ITEM No.	PART NAME	ROLAND PART No.	NOTES
M1	Tuning Cap.	CV67	2 Gang (17-575MMF, 18-185MMF)

CHASSIS—BOTTOM VIEW

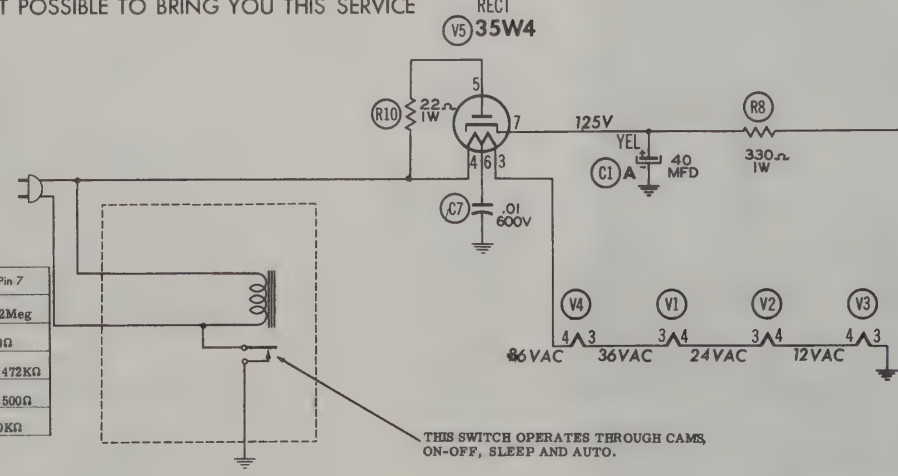


ROLAND Model 5C5



IF=455KC

THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12BE6	22KΩ	.5Ω	36Ω	24Ω	† 2.5KΩ	† 2.5KΩ	3.2Meg
V 2	12BA6	3.2Meg	0Ω	24Ω	12Ω	† 2.5KΩ	† 2.5KΩ	150Ω
V 3	12AT6	6.8Meg	0Ω	0Ω	12Ω	1Meg	1Meg	† 472KΩ
V 4	50C5	150Ω	470KΩ	36Ω	86Ω	470KΩ	† 2.5KΩ	† 500Ω
V 5	35W4	TP	TP	86Ω	121Ω	143Ω	116Ω	100KΩ

† MEASURED FROM PIN 7 OF V5.

TP-TIE POINT

ALL MEASUREMENTS TAKEN WITH CLOCK DISCONNECTED

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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309-15

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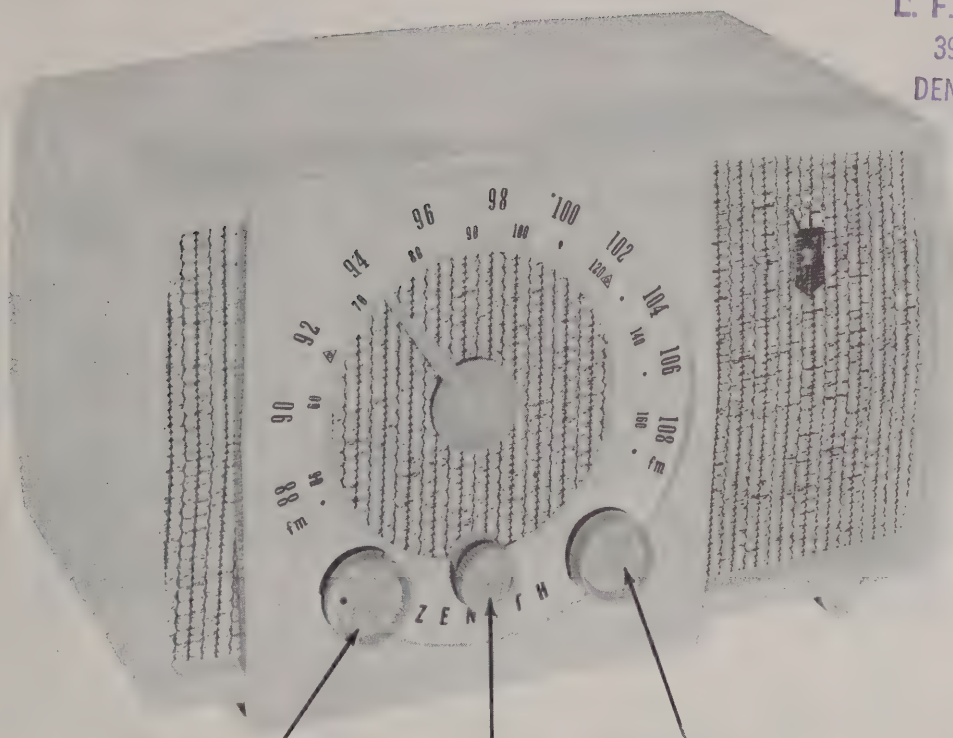
ZENITH MODELS T723 (Ch. 7T04), T724 (Ch. 7T02)



ZENITH MODELS T723 (Ch. 7T04), T724 (Ch. 7T02)

TRADE NAME	Zenith Models T723 (Ch.7T04), T724 (Ch. 7T02)	
MANUFACTURER	Zenith Radio Corp., 6001 Dickens Ave., Chicago 39, Ill.	
TYPE SET	AC-DC Operated AM-FM Superheterodyne Receiver	
TUBES (Seven)	Types 12BA6 FM RF Amp., 12AT7 FM-AM Mixer-Osc., 12BA6 1st. FM-AM IF Amp., 12BA6 2nd. FM-AM IF Amp., 12AU6 FM Limiter, 19T8 Discriminator-AM Det.-AVC-AF Amp., 35C5 Output	
POWER SUPPLY	110-120 Volts AC-DC	RATING .3 Amp. @ 117 Volts AC
TUNING RANGE - BROADCAST	540KC-1620KC	FREQ.MOD. 88MC-108MC

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		ZENITH PART No.	STANDARD REPLACEMENT		
V1	FM RF Amp.	12BA6	12BA6	7BK	
V2	FM-AM Mixer-Osc.	12AT7	12AT7	9A	
V3	1st. FM -AM IF Amp.	12BA6	12BA6	7BK	
V4	2nd. FM-AM IF Amp.	12BA6	12BA6	7BK	
V5	FM Limiter	12AU6	12AU6	7BK	
V6	Discriminator-AM Det.-AVC-AF Amp.	19T8	19T8	9E	
V7	Output	35C5	35C5	7CV	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	ZENITH PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	■80	150	22-1757	AFH2-19	XB004	FP216	TM-8040-150	D085	TVL-3440
B	▲40	150							

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	ZENITH PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	10000		22-3	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C3	7.5		22-1852							
C4	100		22-5	BPD-0001	DD-101	G042	801-101	UC-531	5GA-T1	
C5	1000									
C6	1000		22-1676	SI1000	D6-102	TP52	GP2L-102	UC-521	5HK-D1	
C7	22		22-1506							
C8	50		22-1367	SI50	D6-500	TP30	831-500	UC-545	5GA-Q5	
C9	22		22-1506							
C10	10000		22-3	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C11	.68		22-1766		TCZ-R68	TZ02	NP0A-R68			
C12	1000		22-1676	SI1000	D6-102	TP52	GP2L-102	UC-521	5HK-D1	
C13	10000		22-3	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C14	10000		22-3	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C15	.05	200	22-829	BPD-05	DF-503	CUB2S5		PT415	2TM-S5	
C16	.004	600	22-448	SI4000	D6-402	CUB6D4	GP2-333-402	PT624	6TM-D4	
C17	2200		22-18	BPD-0022	DD-222	K073	811-0022	UC-5222	5HK-D22	
C18	10000		22-3	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C19	30		22-1887	SI30	D6-300	TP27	GP1K-300	UC-543	5GA-Q3	
C20	10000		22-3	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C21	1000		22-17	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C22	120		22-5	NP0-SI120	TCZ-120	TZ32	NP0-333-121		5TCC-T12	
C23	10000		22-3	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C24	470		22-6	BPD-00047	DD-471	K060	GP2K-471	UC-5347	5GA-T47	
C25	10000		22-3	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C26	10000		22-3	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C27	.05	200	22-1158	BPD-05	DF-503	CUB2S5		PT415	2TM-S5	
C28	10000		22-3	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C29	10000		22-3	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C30A	4700		22-2567	BPD-2X0047	DD2-502	DK079	811-0047	DC-525	5HK-2D47	
B	4700						811-0047	DC-525		
C31	4000			SI4000	D6-402	TP62	811-004	UC-524	5HK-D4	Note 1

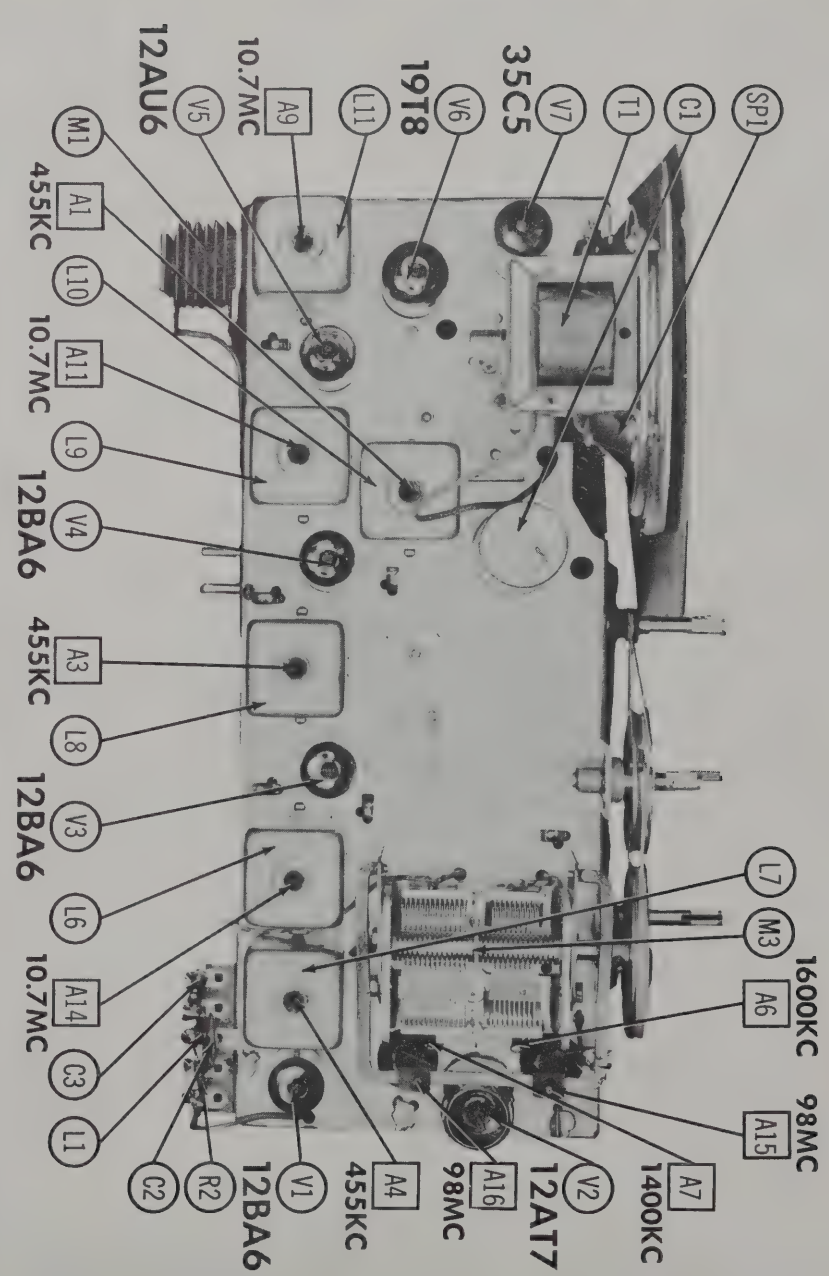
Note 1. Used in chassis 7T02 only.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	ZENITH PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	1Meg	½	63-2143	AB-70	A47-1Meg-S	Q13-137	U-53	Volume
B	Shaft		Not Req.	AK-4	KSS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	KB-1	SWE-12	76-1	US-26	Attach to R1A
R2A	500KΩ	½	63-2144	AB-617	A47-500K-S	Q11-133	SU-50	Tone - Note 1
B	Shaft		Not Req.	AK-4	FKS-1/4	Not Req.	Not Req.	Attach to R2A

Note 1. Used in chassis 7T02 only.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA ZENITH PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R3	2.2Meg	½	63-1926	BTS-2.2Meg	
R4	220Ω	½	63-1758	BTS-220	
R5	10KΩ	½	63-1828	BTS-10K	
R6	1KΩ	½	63-1786	BTS-1K	
R7	220Ω	½	63-1758	BTS-220	
R8	2200Ω	½	63-1800	BTS-2200	
R9	4.7Meg	½	63-1940	BTS-4.7Meg	
R10	4.7Meg	½	63-1940	BTS-4.7Meg	
R11	220Ω	½	63-1758	BTS-220	
R12	2.2Meg	½	63-1926	BTS-2.2Meg	
R13	1Meg	½	63-1912	BTS-1Meg	
R14	220Ω	½	63-1758	BTS-220	
R15	100KΩ	½	63-1870	BTS-100K	
R16	100Ω	½	63-1744	BTS-100	
R17	220Ω	½	63-1758	BTS-220	
R18	100KΩ	½	63-1870	BTS-100K	
R19	15KΩ	½	63-1835	BTS-15K	
R20	150KΩ	½	63-1876	BTS-150K	
R21	150KΩ	½	63-1876	BTS-150K	
R22	100KΩ	½	63-1870	BTS-100K	
R23	47KΩ	½	63-1856	BTS-47K	
R24	820Ω	½	63-1782	BTS-820	
R25	4.7Meg	½	63-1940	BTS-4.7Meg	
R26	470KΩ	½	63-1898	BTS-470K	
R27	470KΩ	½	63-1898	BTS-470K	
R28	150Ω	½	63-1750	BTS-150	
R29	2200Ω	½	63-1800	BTS-2200	
R30	1000Ω	4	63-3296	PW4-1000	
R31	22Ω	1	63-3197	BTA-22	
R32	100KΩ	½	63-1870	BTS-100K	Note 1
R33	470KΩ	½	63-1898	BTS-470K	

Note 1. R31 used in series with indicatbr lamp on chassis 7T02 only.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA ZENITH PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	2.8KΩ	3.4Ω	206-667	Z1001	A-2928	A-3876	24S50	S-1X	

SPEAKER

ITEM No.	RATINGS SIZE	RATINGS FIELD	RATINGS V. C. IMP.	REPLACEMENT DATA ZENITH PART No.	REPLACEMENT DATA QUAM PART No.	REPLACEMENT DATA RCA TYPE No.	NOTES
SP1	4"	PM	3.4Ω	49-667	4A07	223S1	① Used in Model T724
	5 1/4"	PM	3.4Ω	49-689 ①	52A1	217S1	

COILS (RF-IF)

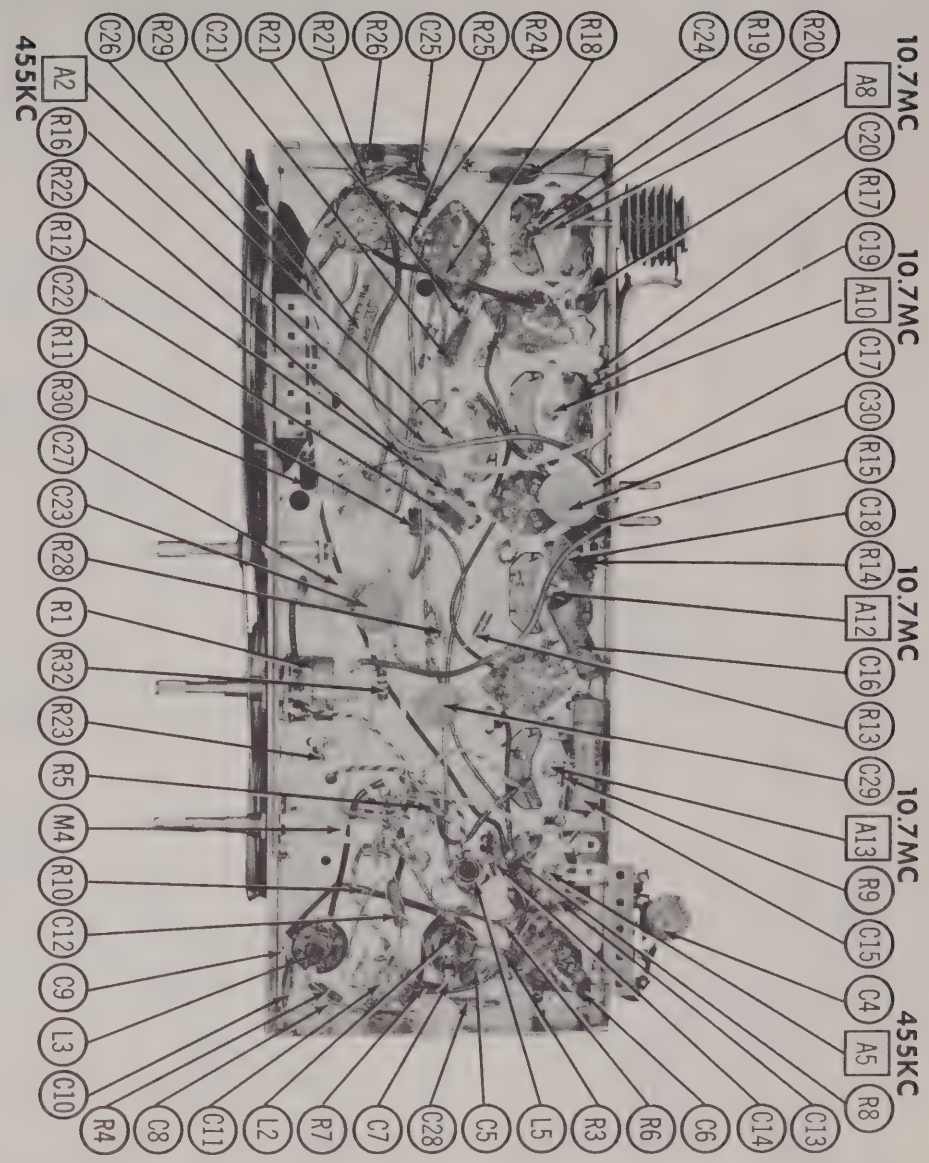
ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA ZENITH PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	FM Ant. Coil	0Ω		20-355				
L2	FM RF Coil	0Ω	0Ω	S-13871				
L3	FM Osc. Coil	0Ω	0Ω	S-15733				
L4	BC Loop Ant.	3.3Ω		S-22944				Includes cabinet back Core part #149-85- Note 1
L5	BC Osc. Coil	5.3Ω		S-22914				
L6	1st. FM IF	.4Ω	.4Ω	95-1150	16-3487 *	FM-251 ■	1451 ■	
L7	1st. AM IF	5Ω	17Ω	95-1250	16-6666	BC-368	1312-C1	
L8	2nd. FM-AM IF			95-1251				FM-2.3Ω, AM-26Ω
L9	3rd. FM IF	.4Ω	.4Ω	95-1150	16-3487 *	FM-251 ■	1451 ■	
L10	3rd. AM IF	17Ω	17Ω	95-1102	16-6770 *	BC-355 *	12-C6 *	
L11	Discriminator	.4Ω	.4Ω	95-1153	17-3484 ▲	FM-250 ▲	1452 ▲	

Note 1. Tapped ⓐ .7Ω and 2.2Ω.
* Remove center spade bolt mounting support and use adaptor plate.
■ Remove center spade bolt mounting support.
▲ Remove center spade bolt mounting support and add diode filter externally.

SELENIUM RECTIFIER

ITEM No.	RATING CURRENT	REPLACEMENT DATA ZENITH PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	NOTES
M1	.080ADC	212-13	1005A	RS-100	6S100	5M1	100A	

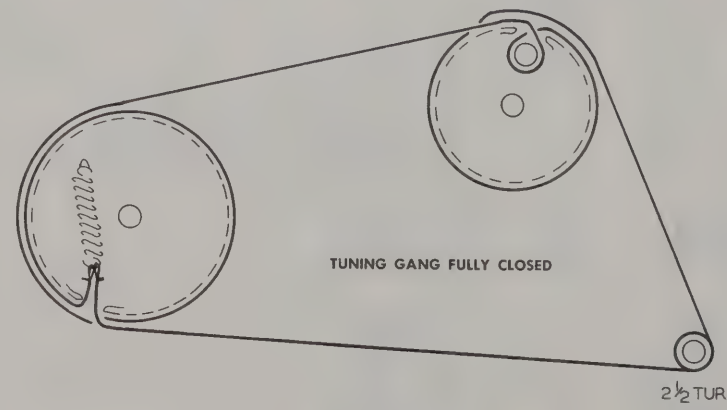
CHASSIS—BOTTOM VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

MISCELLANEOUS

ITEM No.	PART NAME	ZENITH† PART No.	NOTES
M2	Dial Light	100-105	#NE51 - Used in chassis 7T02 only.
M3	Tuning Cap.	22-1742	2 Gang (19-460MMF, 15-185MMF)
M4	Switch	85-481	Band (6P - 2 position - Rotary, wafer type)
	Cabinet	14-1350	Model T723R
	Cabinet	14-1878	Model T723F
	Cabinet	14-1879	Model T723W
	Cabinet	14-1908	Model T723G
	Cabinet	14-1273	Model T724R
	Cabinet	14-1399	Model T724F
	Cabinet	14-1880	Model T724W
	Cabinet	14-1398	Model T724G
	Knob	46-1400	Band switch - Models T723R, F, W, G
	Knob	46-1399	Band switch - Models T724R, F, W, G
	Knob	46-1398	Tuning - Models T723R, F, W, G
	Knob	46-1308	Tuning - Models T724R, F, W,G
	Knob	46-1397	On-off-volume - Model T723R
	Knob	46-1402	On-off-volume - Models T723F, W, G
	Knob	46-1396	On-off-volume - Model T724R
	Knob	46-1401	On-off-volume - Models T724F, W, G
	Knob	46-901	Tone - Model T724R
	Knob	46-1403	Tone - Models T724F, W, G
	Dial Pointer	59-258	Models T723R, F, W, G
	Dial Pointer	59-251	Models T724R, F, W, G
	Dial Scale	26-463	Models T724R, F, W, G
	Handle	36-91	Model T724R
	Handle	36-112	Models T724F, W, G



DIAL CORD STRINGING

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.
Use isolation transformer, if available. If not, connect a .1MFD capacitor in series with low side of signal generator and B-.
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.05MFD	High side to pin 2 (grid) of 12AT7 (V2). Low side to chassis.	455KC (400∿ Mod.)	BC	600KC	Across Voice Coil	A1, A2, A3, A4, A5	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.		High side to AM ant. terminal. Low side to chassis.	1620KC	"	Tuning gang fully open	"	A6	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	1400KC	"	Tune to 1400KC signal.	"	A7	"

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Use 2Meg resistor in series with DC probe of VTVM.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
4.	.05MFD	High side to pin 1 (grid) of 12AU6 (V5). Low side to chassis.	10.7MC (Unmod.)	FM	Point of non-interference	DC probe to point Ⓐ. Common to chassis.	A8	Adjust for maximum deflection.
5.	"	"	"	"	"	DC probe to point Ⓑ. Common to chassis.	A9	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
6.	"	High side to pin 1 (grid) of 12BA6 V4.. Low side to chassis.	"	"	"	DC probe to pin 1 (grid) of 12AU6 (V5). Common to chassis.	A10, A11	Adjust for maximum deflection.
7.	"	High side to pin 1 (grid) of 12BA6 (V3). Low side to chassis.	"	"	"	"	A12	"
8.	"	High side to pin 2 (grid) of 12AT7 (V2). Low side to chassis.	"	"	"	"	A13, A14	"

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
4.	.05MFD	High side to pin 1 (grid) of 12AU6 (V5). Low side to chassis.	10.7MC (450KC Swp)	FM	Point of non-interference	Vert. Amp. to point Ⓐ. Low side to chassis.	A8	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
5.	"	"	"	"	"	Vert. Amp. to point Ⓑ. Low side to chassis.	A9	Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A8 for maximum amplitude and straightness of crossover lines.
6.	"	High side to pin 1 (grid) of 12BA6 (V4). Low side to chassis.	"	"	"	Vert. Amp. to pin 1 (grid) of 12AU6 (V5). Low side to chassis.	A10, A11	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
7.	"	High side to pin 1 (grid) of 12BA6 (V3). Low side to chassis.	"	"	"	"	A12	"
8.	"	High side to pin 2 (grid) of 12AT7 (V2). Low side to chassis.	"	"	"	"	A13, A14	"

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
9.	270Ω Carbon Resistor	High side thru 270Ω to FM antenna terminal. Low side to chassis.	98MC (Unmod.)	FM	98MC	DC probe to pin 1 (grid) of 12AU6 (V5). Common to chassis.	A15, A16	Adjust, in order given, for maximum deflection.

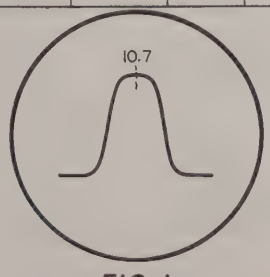


FIG. 1

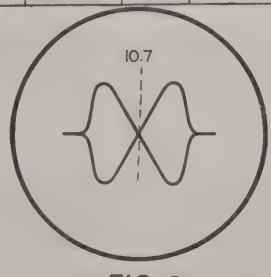
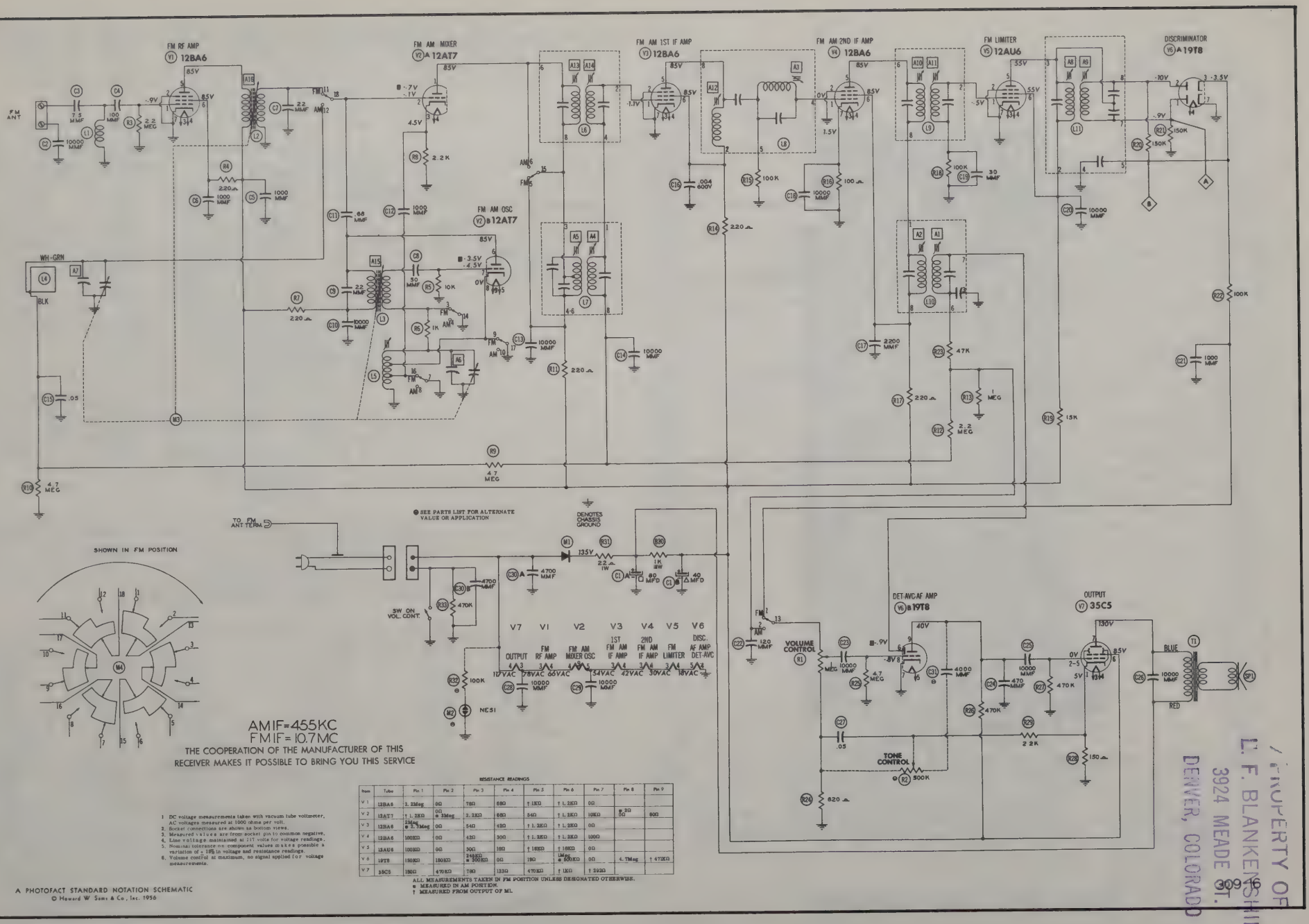


FIG. 2



RESISTANCE READINGS

from	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	12BA6	2.2Meg	0Ω	78Ω	68Ω	↑ 1KΩ	↑ 1.2KΩ	0Ω		
V 2	12AT7	↑ 1.2KΩ	0Ω ● 2Meg	2.2KΩ	68Ω	54Ω	↑ 1.2KΩ	10KΩ	8.2Ω 0Ω	80Ω
V 3	12BA6	2Meg ● 2.2Meg	0Ω	54Ω	42Ω	↑ 1.2KΩ	↑ 1.2KΩ	0Ω		
V 4	12BA6	100KΩ	0Ω	42Ω	30Ω	↑ 1.2KΩ	↑ 1.2KΩ	100Ω		
V 5	12AU6	100KΩ	0Ω	30Ω	18Ω	↑ 18KΩ	↑ 18KΩ	0Ω		
V 6	19T8	150KΩ	150KΩ	240KΩ ● 300KΩ	0Ω	18Ω	1Meg ● 600KΩ	0Ω	4.7Meg	↑ 47KΩ
V 7	35C5	18Ω	470KΩ	78Ω	123Ω	470KΩ	↑ 1KΩ	↑ 292Ω		

ALL MEASUREMENTS TAKEN IN FM POSITION UNLESS DESIGNATED OTHERWISE.
● MEASURED IN AM POSITION.
↑ MEASURED FROM OUTPUT OF M1.

1. DC voltage measurements taken with vacuum tube voltmeter, AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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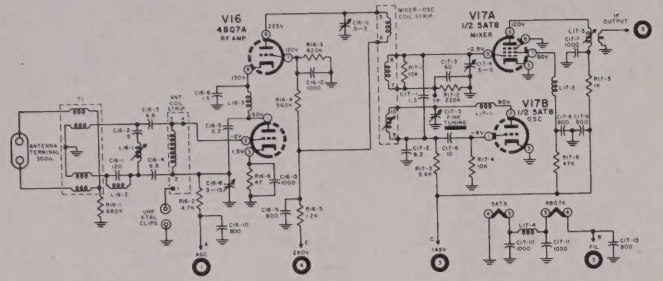
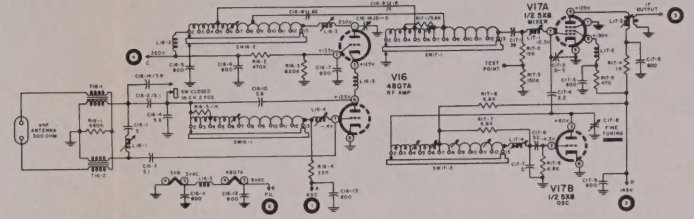
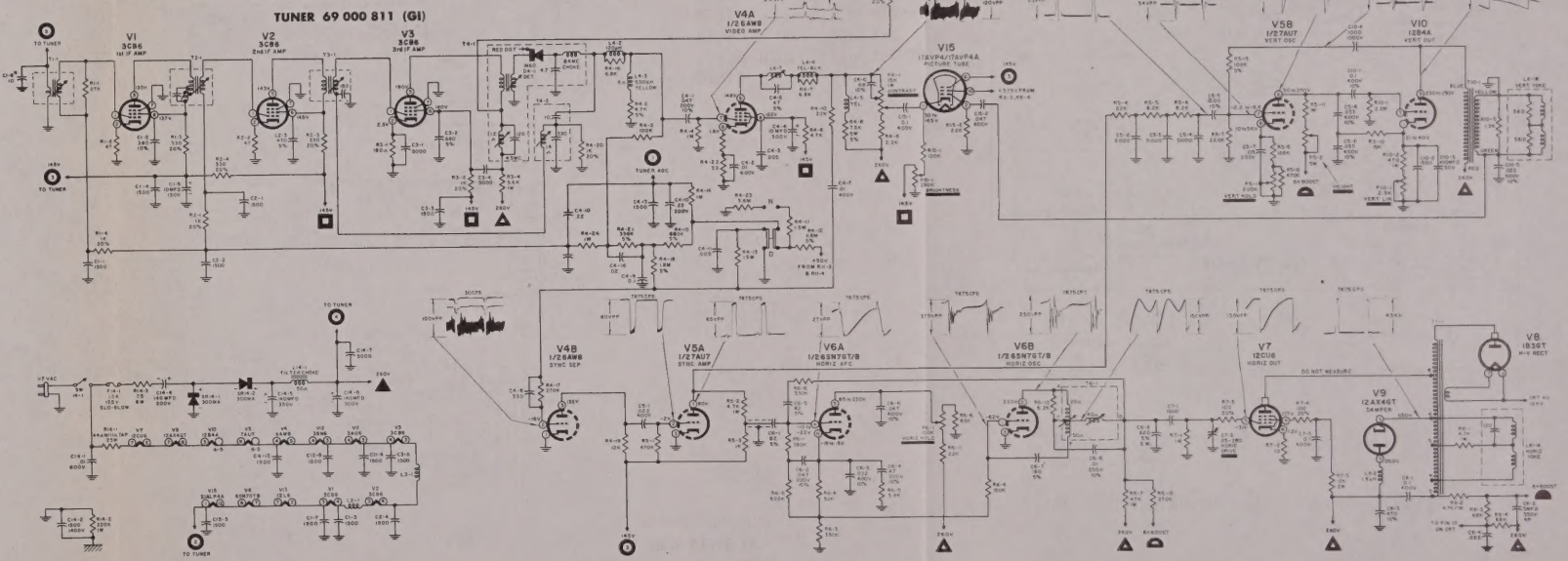
2017 Television Receiver Chassis

TUNER 69 000 801 (SC)



TUNER 69 000 811 (GI)





1. Solid geometric symbols indicate B+ voltage sources—open symbols indicate points of application.
2. Numbered circles indicate tuner lead connections.
3. Component symbols are coded to indicate tube near which component is located on schematic. Ex. C9-2; capacitor, located near V9.
4. All d-c voltages measured with a VTVM connected between the chassis and tube socket terminals, with channel selector set between channels and the Normal-Distant switch (SW4-1) in the normal position. Where readings are affected by control settings, voltages are shown for the clockwise and counterclockwise positions of the controls. Tuner voltages taken with channel selector set to an unused channel and the Normal-Distant switch in the normal position.
5. All waveforms and peak to peak readings taken with strongest signal available; horizontal and vertical holds set at normal position.
6. All resistors are ½W, ± 10% unless otherwise indicated. K=X1,000; M=X1,000,000.
7. All capacitors are 500 WV unless otherwise indicated. Values less than one are microfarads and values more than one are microfarads, unless otherwise indicated.
8. All coil and winding resistances were taken with the components disconnected from the circuit.

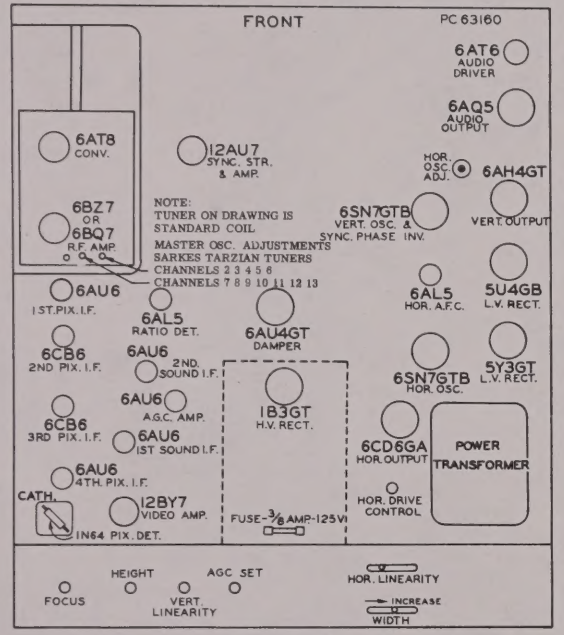
* Indicates change in schematic, as listed below. C1-8, #23 001 000 is not used in some chassis.

SCHEMATIC NOTES

CBS MODELS

6T101 (Ch. 2017)
6T103 (Ch. 2017)
6T104 (Ch. 2017)

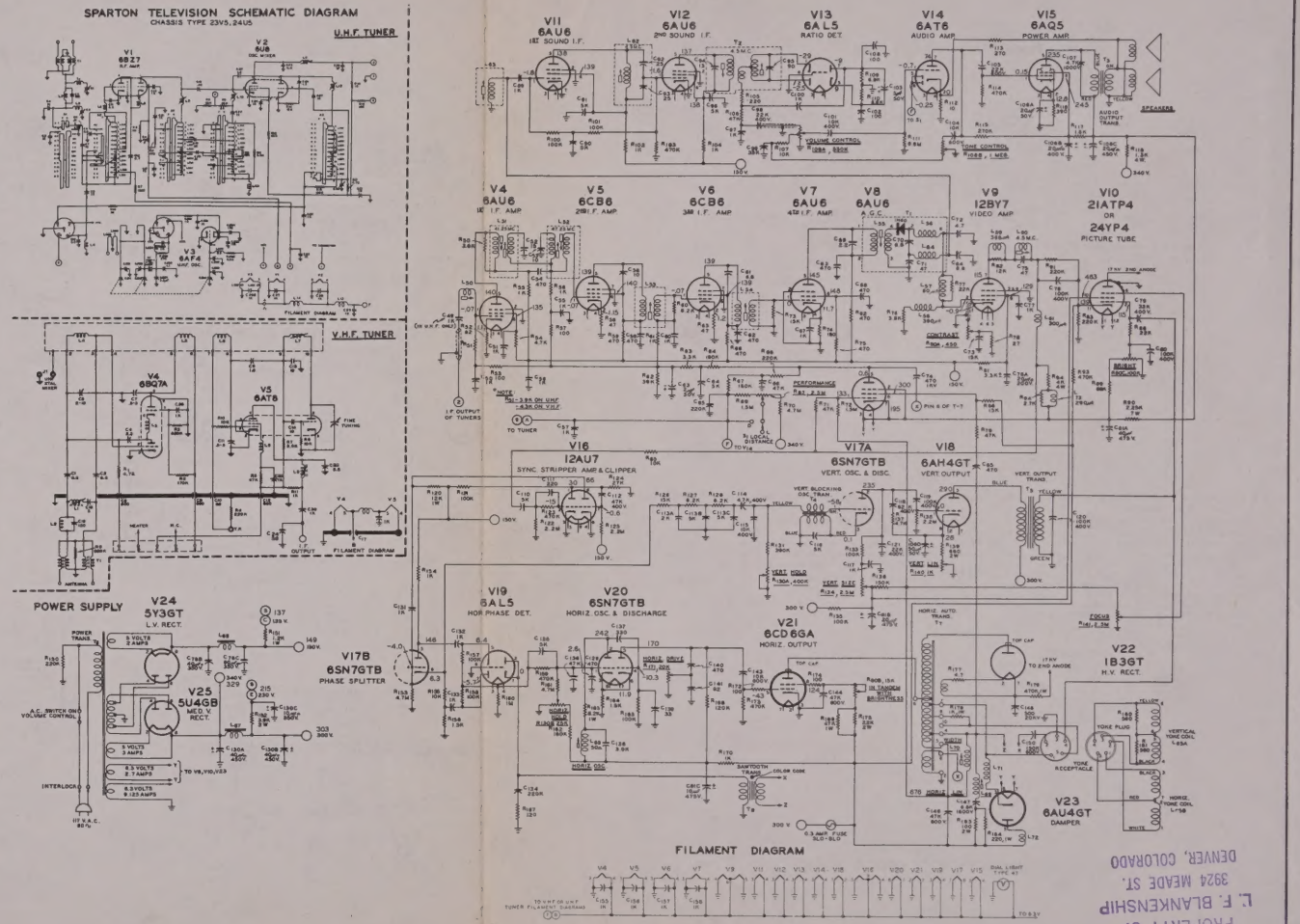
SCHEMATIC COURTESY CBS-COLUMBIA



SCHEMATIC COURTESY SPARTON RADIO-TELEVISION

SPARTON MODELS

50TM21	(Ch. 23V5)
50TM21U	(Ch. 24U5)
51CM21	(Ch. 23V5)
51CM21U	(Ch. 24U5)
52CL24	(Ch. 23V5)
52CM24	(Ch. 23V5)
52CM24U	(Ch. 24U5)



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